Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

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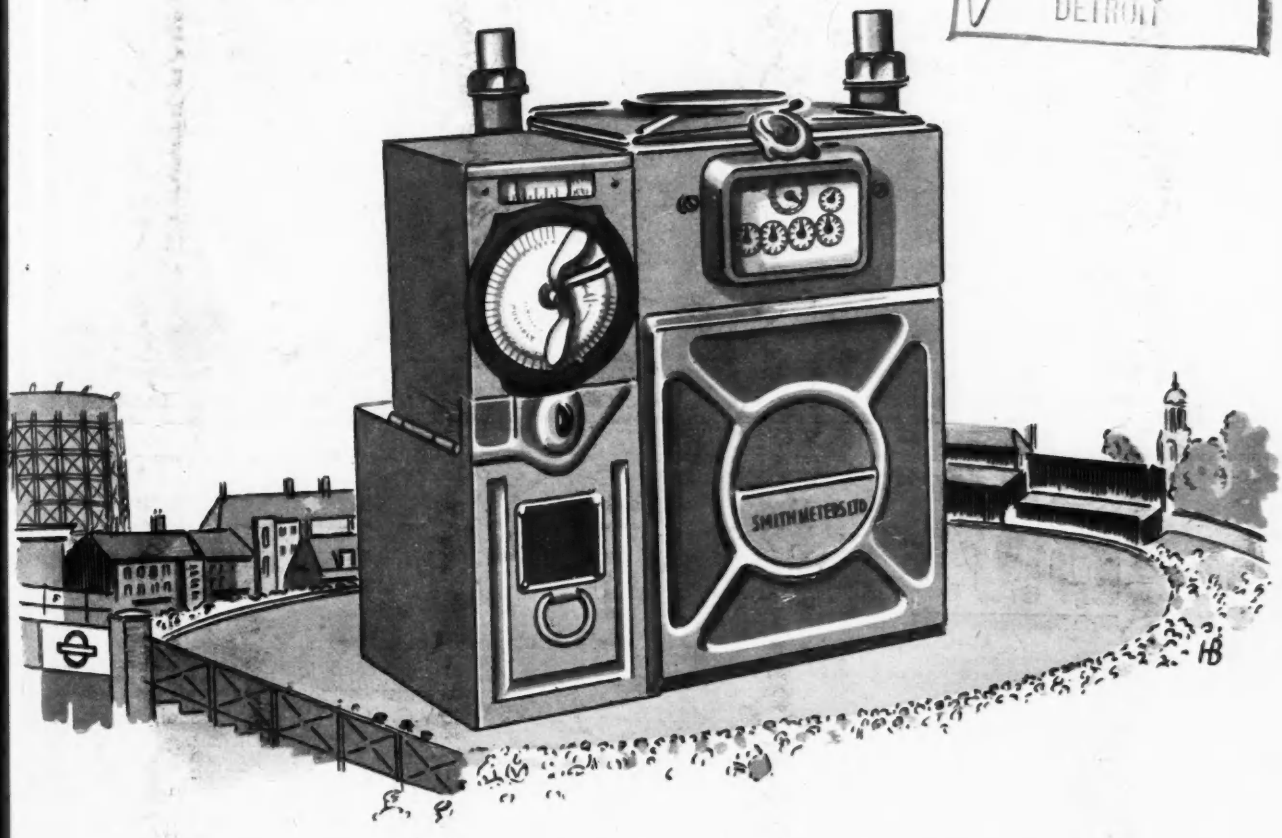

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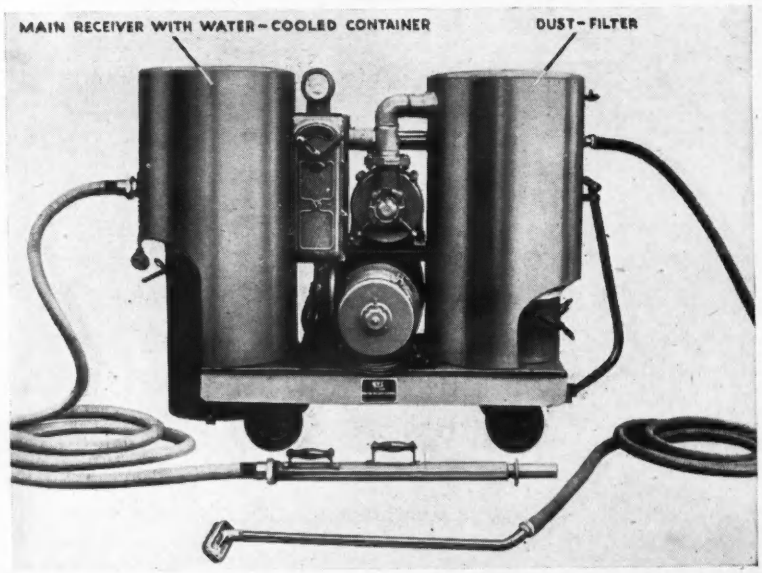

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GAS JOURNAL, OCT. 24, 1945
VOL. 246 97th YEAR No. 4301

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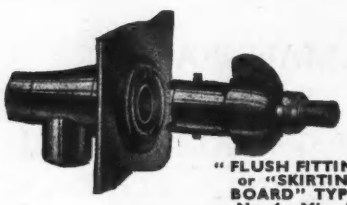

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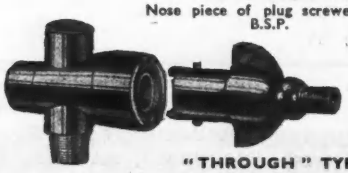

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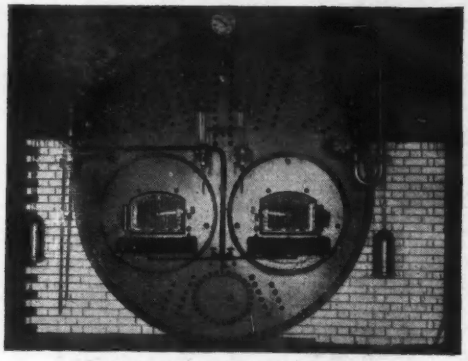

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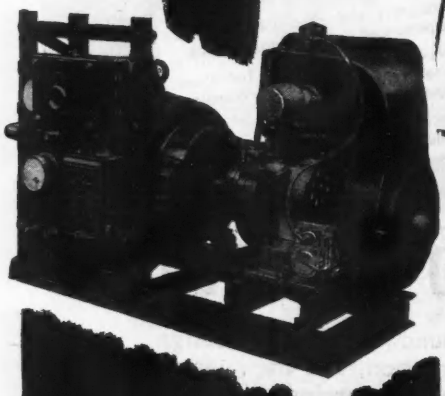

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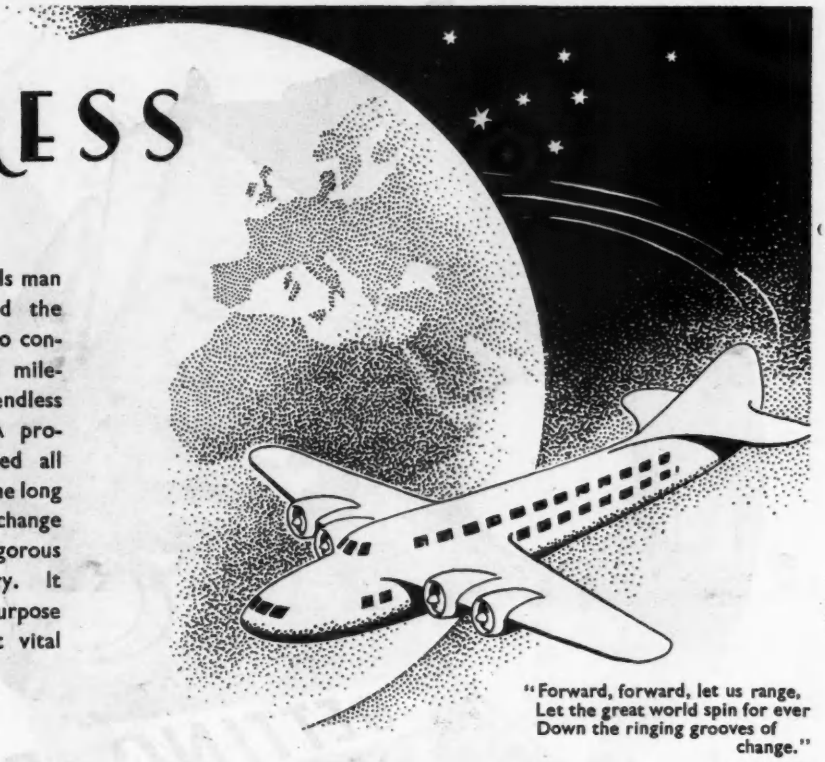
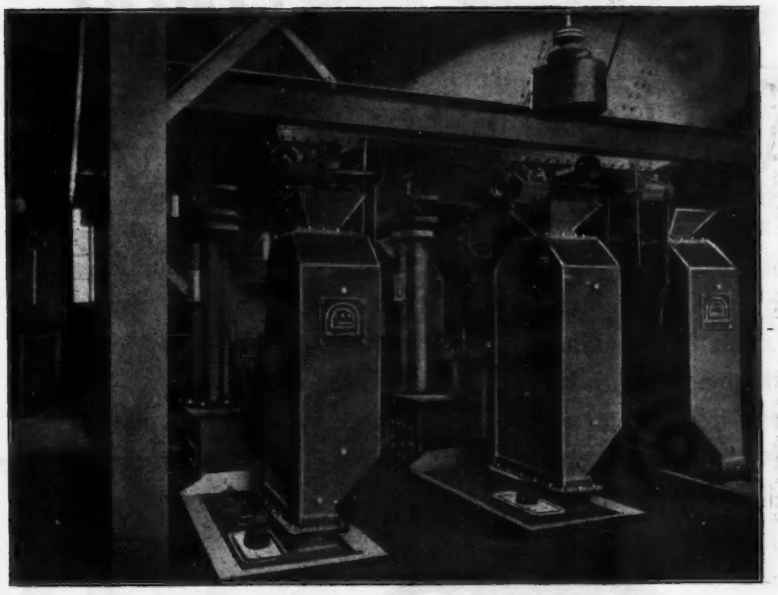


"Forward, forward, let us range,
Let the great world spin for ever
Down the ringing grooves of change."
—TENNYSON



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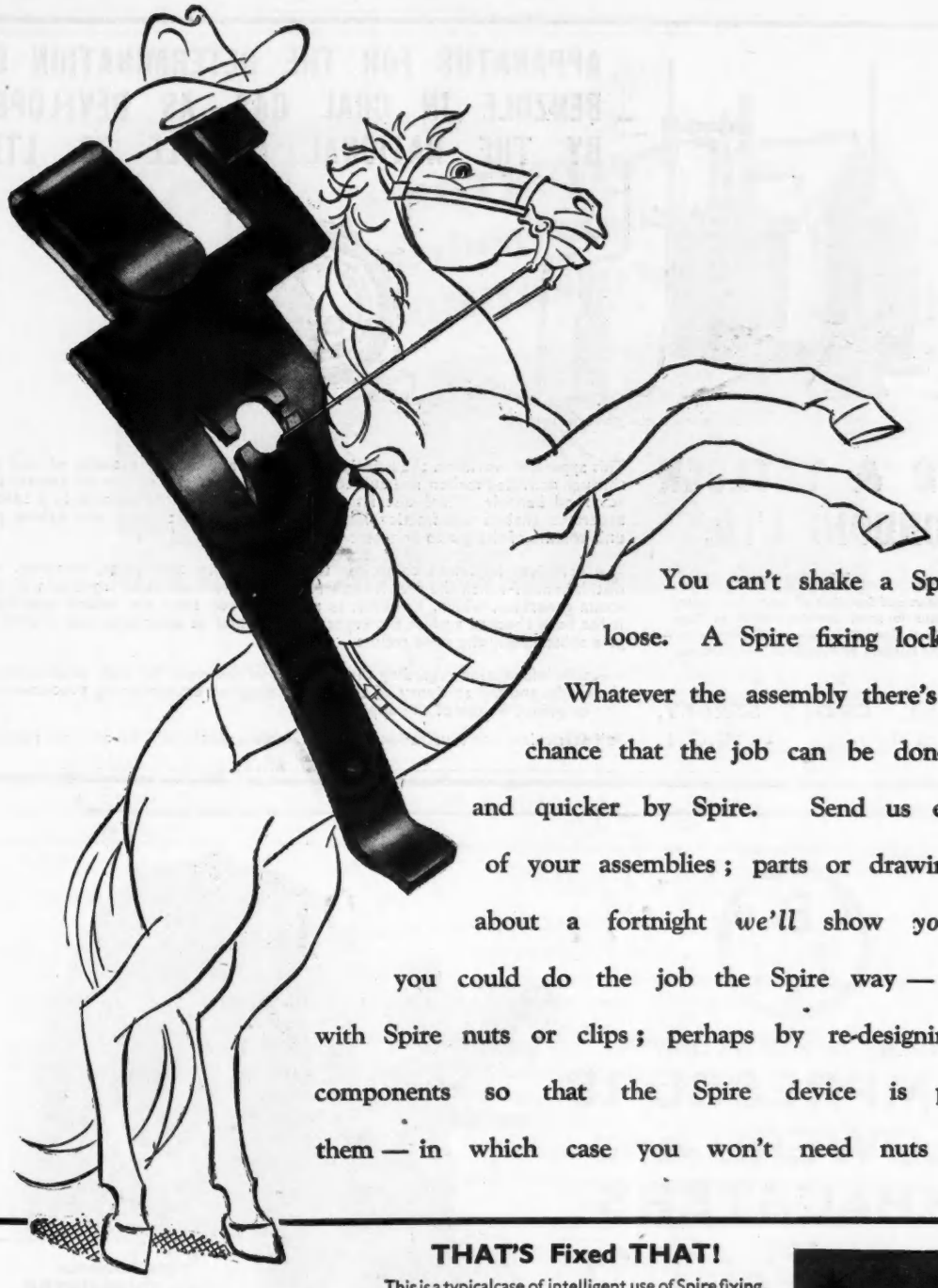

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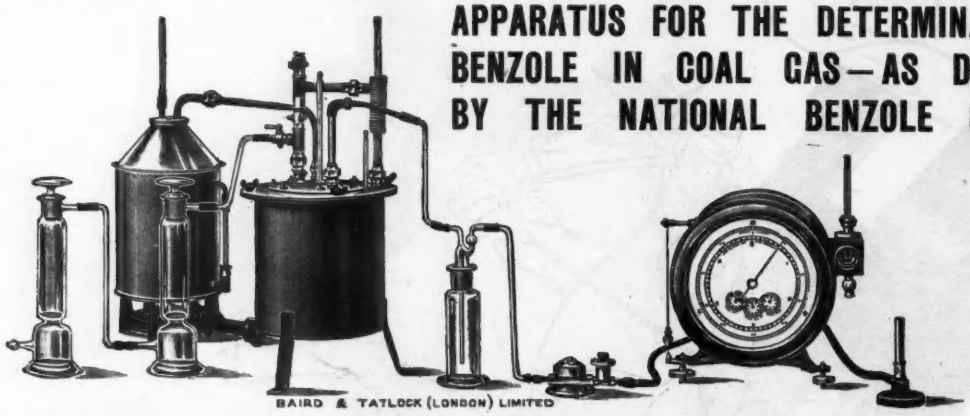

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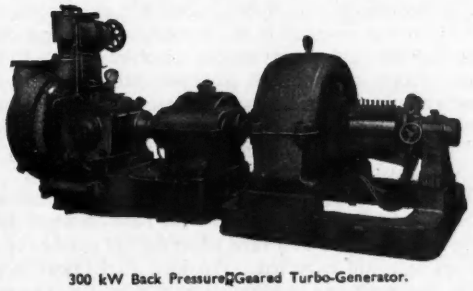

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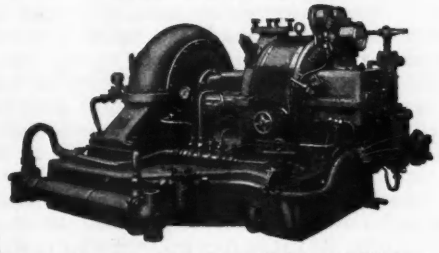

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GAS JOURNAL, OCT. 24, 1945

VOL. 246 · 97th YEAR No. 4301

EDITORIAL NOTES

FOUNDATION OF PROSPERITY

THE Minister of Fuel and Power, Mr. Shinwell, spoke last week at the annual luncheon of the Institute of Fuel held in London on the coming nationalization of the mines and of the fuel industries generally. He decribed these industries, in which he naturally included gas, electricity, and oil, as the very foundation of our future industrial prosperity, adding that the Government had a mandate to proceed with a declared policy. The power they had invoked at the election to apply that policy must, however, be used with the greatest reason and discretion and not in a doctrinaire fashion; and he went on to emphasize the great need for co-operation between the men in the mines, the colliery agents, those engaged in the gas and electricity industries, and the Civil servants. He stressed, too, that it had never been the Government's intention to entrust the administration of the mining or the gas industry to the Civil Service.

The luncheon, at which, as President of the Institute, Dr. E. W. Smith was in the chair, was attended by over 600 guests and members and proved another highly successful event in the Institute's history. Two Melchett medals were presented, that for 1940 to the French Ambassador for presentation to M. Etienne Audibert, the leading fuel expert of France, and that for 1945 to Professor C. H. Lander, of the Imperial College of Science and Technology, whose work on fuel, both as Director of Fuel Research and in his present capacity, is well known throughout the Gas Industry. It was a happy coincidence that Professor Lander should be awarded this medal during the year when the Imperial College celebrates its centenary, in which connexion the King will broadcast from the Albert Hall to-morrow evening.

In his Melchett Lecture, given on Wednesday last, Professor Lander took as his theme another of the foundations of future prosperity—namely, teamwork in research—and there can hardly be other than agreement with his contention that, while the lone researcher will always fulfil an important role, there are many problems so complex, or carried out under such extreme physical conditions, or with such exacting requirements of apparatus, that they are utterly beyond the capacity of any single worker and can only be successfully explored by a competent leader assisted by engineers, physicists, chemists, and so on, with first rate fundamental training. With the vast expansion of science the requirements of a team have correspondingly increased. Universities can help greatly in obtaining data of a fundamental nature, and in this regard the Imperial College of Science and Technology has been far from behindhand. A visit to the College last week afforded us ample evidence of this, the demonstrations shown to us being fascinating. As example, we may take investigation into the dispersal of fog—*i.e.*, "Fido"—a matter we discussed briefly in these columns a fortnight ago under the heading of "team-work research." The magnitude of the hydraulic, thermal, and combustion problems involved in the solution of this problem cannot be generally realized. Radiation fogs require burner capacities up to 30 therms per yard per hour; a bomber airfield may easily contain 4,000 yards of burner length, with a consumption of 120,000 therms an hour, and this consumes at least 110,000,000 cubic feet of air. The burner installation at London's new airport, Heathrow, will consist of 12,000 yards, divided for remote control purposes into sections of 70 yards.

"Fido" was one of the instances of the successful outcome of teamwork research referred to by Professor Lander in his Melchett Lecture. Lately there has been proved the possibility of the utilization of atomic energy, and on later pages we give a further article on this subject based upon a most important communication from the United States of America. This possibility has been achieved only by such co-operation as was emphasized by Professor Lander; and on Saturday last, at the General Electric Company's works in Schenectady, New York, the world's most powerful "electron accelerator" was demonstrated. Still another name comes on the horizon—the "Batatron," a device described as of iron, glass, and copper, weighing 130 tons, and capable of emitting an electron stream at approximately the speed of light—rays which are able, it is stated, to penetrate as if it were butter nearly 12 inches of the toughest armour plate. The value of the batatron, it is anticipated, will be vast. Scientific progress now depends on full co-operation of those divisions which in the past have neglected and hampered the efforts of workers in the fields of so-called borderline subjects.

TEMPORARY HOUSING

MUCH has happened since we referred, on June 13 (p. 752), to the progress made up to that time with the Government's temporary housing programme. A thousand temporary dwellings had then been completed; erection had started on 2,500; sets of components for about 5,000 had been delivered from the factories; and foundations for 12,000 were in course of construction. About 30,000 houses were expected from the United States under Lend-Lease. World hostilities have since ceased, there has been a change of Government, costs have increased, Lend-Lease has ended, and instead of getting 30,000 American houses at £800 each, we are getting only about 8,150, and they are to cost about £1,330 each.

The Minister of Works reported to the House last week that the average cost of the remaining types of temporary houses had arisen since January from £785 to £1,055 apiece, an increase of £270 per house, or allowing for differences in the numbers ordered, an average of £268 per house. The increase comprises £89 on account of revised estimates for site preparation, £96 for improvements and modifications in superstructure, the need for which was revealed in the preparation of production drawings, £25 for fixtures and fittings which may have to be bought from smaller or less well equipped firms because the larger firms are still engaged on war contracts, £15 for breakages and losses, for which no separate allowance was made in the original estimates, £23 for contingencies, and £20 for Ministry of Works agency costs.

The Health Departments had allocated to local authorities 165,000 temporary houses before the date on which Lend-Lease came to an end, and at a time when the full number of American houses was still expected. Provided Parliament is willing to make the necessary additional provision the Government is prepared to supply houses up to that total allocation by increasing the number of British houses, and a provisional programme has been framed up to a total of 158,480 houses, including a total of 54,500 aluminium houses, at a total cost of £184,669,470, compared with the £150,000,000 provided in the Housing (Temporary Accommodation) Act.

A table of progress up to Oct. 1 included in the Minister's statement showed that 130,794 houses had been allocated to local authorities in England and Wales, and 34,300 in Scotland, of which 4,049 and 103 respectively had been completed. Sites handed over by local authorities numbered 52,621 in England

and Wales and 7,346 in Scotland; hulls delivered to sites totalled 10,620 and 734 respectively; and 9,603 and 604 houses had been begun. Orders had actually been placed for 145,830 houses, including 50,000 aluminium and the 30,000 American, of which 21,530 had been delivered from production. In view of the termination of Lend-Lease the number of American houses to be provided will be limited to the number already shipped (less damages), approximately 8,150. Local authorities have been offered in substitution an equivalent number of British types and full replies have not yet been received.

Amalgamation

Negotiations have reached an advanced stage for the amalgamation of the adjoining County Boroughs of Smethwick and West Bromwich. Intimation of the "engagement" has been sent by the Smethwick Town Council to the Minister of Health with a view to the matter being considered by the Boundary Commission at the earliest possible date. Both towns have a population in the region of 80,000, but West Bromwich covers much the larger area, embracing 7,172 acres against Smethwick's 2,500, and the gas undertaking in both areas is municipally owned. The last published statistics show that immediately before the war the Smethwick Gas Department had an annual make of 1,051 million cu.ft., and West Bromwich was making 637 million cu.ft. per year. A report on the proposed amalgamation states that both the Smethwick and West Bromwich works are on congested sites, which in neither case will permit of any enlargement of the existing works. It is anticipated that the demand for supplies will increase, especially at Smethwick, and the question of erecting a new joint works is under consideration by the Gas Committees of the two Councils. The amalgamation of the two Boroughs would, says the report, be a definite advantage so far as the manufacture and distribution of gas is concerned. It is 20 years since the first conferences on amalgamation were initiated.

Personal

Mr. RAYMOND PRINCE, Director, General Manager, and Secretary of the Peterborough Gas Company, has been appointed General Manager of the Brighton, Hove and Worthing Gas Company, and will take up his duties there in January. Mr. Prince, who succeeded the late Mr. R. Wardell at Peterborough in 1937, entered the Gas Industry as an articled pupil in the Tipton Gas Department. On completion of his indentures he joined the Royal Air Force, in which he remained until the conclusion of the first Great War. He then rejoined the technical staff at Tipton for a short time prior to being appointed Assistant Engineer to the Heywood (Lancs) Gas Department. In 1925 he was promoted to the position of Engineer and Manager at Heywood, which he relinquished in 1931 on his appointment as Engineer and Manager of the Loughborough Gas Department. He represents the Eastern District on the Executive Board of the British Gas Council.

The appointment will give some much needed relief to the Company's Managing Director, Mr. P. E. Browne. Mr. J. H. SHADBOLT, at present Assistant Works Manager at the Linacre Works of the Liverpool Gas Company, will shortly be taking up the position of Assistant Gas Engineer at the Portslade Works of the Brighton, Hove and Worthing Gas Company.

* * *

Mr. A. H. CRANMER, Chief Engineer of the Wolverhampton Gas Company since 1929, retired from that office on Oct. 1. Mr. Cranmer was trained by his father, the late Mr. J. S. Cranmer, in the Stratford-on-Avon Gas Department, and was later with the Lea Bridge Gas Company. He left Lea Bridge to become Works Superintendent at Wolverhampton in 1902, and was promoted to the position of Chief Engineer in 1929, which position he held until his retirement after 43 years' service with the Company. At a social gathering of all sections of employees on Oct. 13 the Directors made a presentation to Mr. Cranmer of an inscribed gold watch. A presentation was made recently to Mr. Cranmer by the employees of the Company on the occasion of his 70th birthday. As a result of Mr. Cranmer's retirement new appointments have been made, Mr. Cranmer being succeeded as Chief Engineer by Mr. WILLIAM MACNAUGHTON, who has been with the Company for 25 years. Mr. A. G. WILLIAMS, Commercial Manager and Secretary, has been appointed General Manager and Secretary.

* * *

Mr. D. M. MACCORMACK, F.C.A., A.M.Inst.T., has been appointed Secretary of the British Tar Confederation, the members of which are the British Association of Coke Oven Tar Producers, the National Gas Council, and the Association of Tar Distillers. Mr. MacCormack was connected with associations in the road transport industry before the war.

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Mr. B. C. WESTALL, Chairman of Thomas De La Rue & Co., and Mr. CYRIL ASHTON, Vice-Chairman of that Company, have joined the Board of Thomas Potterton (Heating Engineers), Ltd. Mr. LEOPOLD FRIEDMAN has been appointed Managing Director, Mr. T. F. C. POTTERTON will continue to act as Chairman, and Mr. A. B. POTTERTON as Vice-Chairman, and Mr. HERBERT P. BRIDGE will also continue as a Director.

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Mr. T. E. PARRY, Engineer, Manager, and Secretary of the Cannock District Gas Company, has been co-opted a member of the Town Planning and Industrial Development Committee of the Cannock Urban District Council.

* * *

Mr. W. P. MITCHELL, of Ayr, has been appointed Assistant Manager of the Troon Gas Department.

* * *

News has been received by the Parkinson Stove Co., Ltd., that their North of England Representative, Lt.-Col. T. C. WHIMSTER, has been released from Japanese hands and is at present in Australia. He cannot at the moment give any indication as to when he will be returning to this country, but meantime sends his best wishes to friends in the Gas Industry.

West Riding Exhibition

Over 702,000 people attended the Homes for To-morrow exhibition arranged by the *Yorkshire Evening News* at Leeds last month, at which the United Kingdom Gas Corporation staged the attractive gas exhibit described in the "JOURNAL" of Sept. 5. A "General" gas cooker was given by the Corporation as first prize in an opinions contest in which there were 6,800 entries, and a number of gas pokers, supplied and fitted free, were awarded as consolation prizes. The exhibition kitchen has been taken to the Wakefield area of the West Riding Group of Gas Companies, where it was officially opened on Oct. 11 by the Mayor of Wakefield, supported by Col. W. Moncrieff Carr, Managing Director (see p. 558).

In connexion with the exhibition, explanatory notes on the demonstration kitchen and its relation to future policy in respect of the provision of fuel service for the domestic consumer have been distributed to housing authorities, architects, and other interested parties throughout the West Riding area. While the notes are concerned principally with new kitchens, the West Riding Group announces that it offers a free advisory service on the conversion or adaptation of existing kitchens, so as to approach more nearly the standard which will be required by the post-war housewife.

Diary

Oct. 25.—Midland Association of Gas Engineers and Managers: King Edward House, New Street, Birmingham, 2.30 p.m. Presentation by L. W. Andrew (one of the Authors) of the Institution Paper, "Technical Aspects of the Gas Industry's Contribution to Post-War Housing."

Oct. 25.—Town and Country Planning Association: Lunch-time meeting, 28, King Street, Covent Garden, W.C. 2. Talk and discussion on "Town Planning and District Heating."

Oct. 26.—Industrial Gas Centres Committee: Glasgow, 9.30 a.m.

Oct. 26.—Manchester District Association of Gas Engineers: Demonstration Theatre, Manchester Gas Department, 2 p.m. Paper by R. J. Bradshaw on "Use of Town Gas in the Glass Industry."

Oct. 29.—Eastern Counties Gas Engineers' and Managers' Association: Autumn Meeting, Grosvenor House, Park Lane, W. 1.

Oct. 31.—London Juniors: Visit to the coke oven plant at the Gas Light and Coke Company's Beckton Works.

Nov. 2.—London Juniors: Meeting at Gas Industry House. Paper by J. F. Waight, "Applications of 'Neat' Gas in Industry."

Nov. 10.—Yorkshire Junior Gas Association: Britannia House, Bradford, 2.30 p.m. Paper, "Two Fuel Industry," by A. Cole.

Nov. 12.—Women's Gas Council: Executive Committee, 12.45 p.m., Gas Industry House.

Nov. 13.—Institution of Chemical Engineers—the Chemical Engineering Group: Joint meeting, Burlington House, 5.30 p.m. Paper, "Some Practical Aspects of Large-scale Gas Distribution, with Particular Reference to Steelworks," E. Hemingway Jones.

Nov. 14.—B.G.C.: Gas Industry House, 2.15 p.m.

Nov. 27–28.—Institution of Gas Engineers: Autumn Research Meeting.

Dec. 6.—Town and Country Planning Association: Lunch-time meeting, 28, King Street, Covent Garden, W.C. 2. Talk and discussion on "Heating the Family Home."

Newport (Mon.) Gas Company has staged a very attractive display in its showroom windows in connexion with the R.A.F. Benevolent Fund Victory Bell Appeal. The display consists of Victory Bells and a number of model aircraft, including a large scale model with a wing span of some 12 ft., with appropriate posters.

Walsall Arbitration

An arbitration took place on Oct. 4 before the National Arbitration Tribunal between the Walsall Corporation and certain of their gas-fitter employees, members of the Gas Industrial Union, previously known as the National Gasfitters' and Allied Workers' Trade Union. The dispute arose out of a claim for the payment of an increase of 0.75d. per hour consequent on the upgrading of the Walsall gas undertaking, and for the maintenance of extra rates paid to gasfitters holding certificates of the City and Guilds of London Institute or for ability to carry out plumbing work.

The official report of the hearing shows that the Union was not a member of the Midland Regional Gas Industrial Council, which had agreed to rates of pay in the region. The Walsall undertaking had, on the application of the National Union of General and Municipal Workers, been upgraded in May, with the proviso that rates higher than those provided under the new category should merge with the rates for that category. The rates paid to first and second class fitters prior to the upgrading were in all cases in excess of those scheduled for either the former or new category, and the undertaking had continued to pay those rates. Evidence was given as to the additional rates paid to fitters holding the first or second class certificates of the City and Guilds of London Institute or for ability to carry out plumbing work.

The Union contended that the workers concerned, with one exception, had had not less than 10 years' service with the undertaking, had always been regarded as first class fitters, and had received a rate of 2s. 1d. per hour plus 0.75d. per hour in the case of those holding certificates or having ability to carry out plumbing work. The Corporation submitted that gasfitters had always been recognized and treated throughout the Industry as gas workers, and that their rates of pay and conditions of service should be regulated by decisions of the National and Regional Joint Industrial Councils. The Union contended that it was not competent for the National Union of General and Municipal Workers to negotiate rates of pay for gasfitters less favourable than those negotiated with the Walsall Corporation by the Gas Industrial Union. They claimed that the differential over the J.I.C. rates which existed in favour of gasfitters prior to the upgrading of the undertaking and the extra rates paid to fitters holding certificates or able to do plumbing work should be maintained.

Having given careful consideration to the statements and submissions made on behalf of the parties, the Tribunal found that the claim had not been established, and awarded accordingly.

Mr. S. S. Ogilvie, Joint Manager of the Federation of Gas Employers, conducted the case on behalf of the Walsall undertaking, the witnesses present being the Chairman of the Gas Committee, the Town Clerk, Assistant Solicitor, and Mr. A. Allen, Engineer and Manager. Mr. Paterson, Secretary of the District Committee of the Federation, was also present. The Union was represented by Mr. F. Webster, National Organizer, Mr. E. Hinks, General Secretary, and other officials.

Wages of Gas Workers

The National Joint Industrial Council for the Gas Industry at a meeting at Gas Industry House on Oct. 18 unanimously agreed that the wages of gas workers should be increased by 1½d. per hour, or 1s. per shift. It is estimated that some 100,000 workers will be affected by this increase.

The Mayor of Wakefield opening the West Riding exhibition. Left to right: Mr. Stonehouse, a leading industrialist, the Deputy Mayor, the Mayoress, the Mayor, Colonel Carr, the Deputy Mayoress, Vice-Admiral A. L. Snagge, a Director of the United Kingdom Gas Corporation, and Mr. H. B. Taylor, General Manager of the West Riding Group of Gas Companies.

Plastics, Aluminium, and Gas

The mutual services of plastics, aluminium, and gas in post-war building were effectively demonstrated at an exhibition arranged by International Plastics, Ltd., in conjunction with Plastic Spray, Ltd., the British Artificial Resin Co., Ltd., and the Gas Light and Coke Company, which was opened at the premises of Runcolite, Ltd., Vere Street, W., on Oct. 15. While the development of plastics has been one of the industrial romances of the war, the Gas Industry has not been lagging, and one of the outstanding exhibits was a cyclone generator designed in collaboration with the Gas Light and Coke Company for use in the process of drying plastic paint. It is a small heat-generating plant, easily manipulated by unskilled labour, enabling a room to be painted in a matter of hours instead of days. The generator produces a mixture of hot chemically loaded gases, which are directed on to the coated surface by means of flexible hose. The gases quickly raise the temperature of the coating to a point at which hardening occurs rapidly, and the flow of gases assists the removal of solvents from the coating and leaves a smooth hard surface on which dust has had little time to adhere. The portability of the apparatus permits the treatment of any surface, either plain or irregular, regardless of size, and in the case of treating a large number of small articles insulated light-alloy generator cabinets can be constructed into which the gases are directed.

The exhibition was mainly of domestic interest, and included a kitchen-bathroom unit somewhat on the lines of that shown at the Gas Industry's own exhibition earlier in the year, but with aluminium and plastics applied to a much greater extent to the various items of equipment. Aluminium and plastic panels were shown as standard units capable of being clipped together by a patented locking system, thus avoiding elaborate systems of studding and similar methods. These cavity panels can be erected by unskilled labour, and are so easy to handle that two women could erect a 9 ft. partition in a couple of minutes. The system can also be used to incorporate plumbing units.

Among the interchangeable features of the kitchen unit was a heatable sink. Designed in collaboration with the Gas Light and Coke Company, it is fitted with gas burners so that in addition to fulfilling its usual purposes the sink can be brought up to boiling point for washing laundry or bottling fruit. Of stainless steel, it is insulated to avoid the possibility of burning the hands when touching the sides. An extractor removes the steam and odour of soapsuds, and a closely-fitting lid further assists in keeping the kitchen atmosphere cool and fresh. The unit also includes double draining boards of aluminium, a wringer fitting into a wall recess, cupboards and drawers of aluminium coated with plastic skin, gas cooker, gas refrigerator, and a smooth level working surface.

Smoke Reduction

Representatives of 200 local authorities and makers of heating appliances and fuel producers met at Caxton Hall, Westminster, on Oct. 19 to discuss improvements in fuel-burning appliances for new houses. Mr. C. W. Key, Parliamentary Secretary to the Ministry of Health, warned them that the time was far from ripe for the Departments concerned to advise the Government to promote legislation to compel the installation of smoke-reducing appliances in all new houses, or even to make it a condition of a housing subsidy to local authorities that they should install such appliances in their new houses.

The extended use of gas and electricity should be encouraged in areas where they could be provided at reasonable cost as compared with other forms of heating and cooking, but any greatly increased demand would upset the economics of the industries. The solution, he urged, was the use of smokeless fuel, or the development of methods of burning bituminous coal whereby smoke was reduced to a minimum.

This Radiation turn-out formed part of the Thanksgiving Week parade at Birmingham. It is of special interest in view of the difficulty of obtaining material suitable for making up displays at the present time and should encourage the revival of lorry displays.

London and Counties Coke Association

The Twelfth Annual General Meeting of the London and Counties Coke Association was held at Grosvenor House, London, on Oct. 15, the President, Mr. FRANK H. JONES, M.Inst.C.E., presiding. On the proposition of Mr. F. M. BIRKS, seconded by Mr. S. E. KNOWLES, Mr. Jones was unanimously re-elected President for the ensuing year. In accepting office, Mr. Jones said it was an easy job, thanks to the excellent work that was done by the officers of the Association.

The PRESIDENT formally moved the adoption of the Annual Report and Accounts.

Colonel H. C. SMITH, Chairman, in seconding, said the main work of the Association during the past year had been that of coke programming. It was work which the Association undertook on behalf of the Ministry of Fuel and Power, and it had been done in the name of the Ministry by Mr. W. L. Boon, who was for that purpose the Ministry's district coke representative. It was a thankless task, and one which Mr. Boon had carried out in an extraordinarily able manner, The need for programming became more apparent every day. Coke was not being fairly distributed before an attempt was made to programme. That was not necessarily the fault of anyone; only by having at one centre details of all producer and distributor consumer requirements was it possible to decide how much coke each should have to cover those requirements. When a distributor was buying from several sources that information was not available to any one producer, so that the distributor might get more than his fair share at the expense of others or, on the other hand, he might get less than his fair share. Last year's programming was their first attempt and they realized that it merely touched the fringe of the problem, and it had to be done in great haste. This year they were attempting a much more comprehensive scheme, but one which it was felt would provide reasonable equity when it was fully operative.

The scheme in brief was to allocate sufficient coke to each merchant (and for that purpose so far as their direct business was concerned gas undertakings would rank as merchants) from named producers so as to enable them each to have a fair share of the available tonnage. Obviously in an area such as was covered by the Association there were varying conditions. There were (although most of them would be surprised to hear it) places where coke was in good supply locally, but in the majority coke was very scarce. The scheme was an attempt to even this out. Unfortunately it took away from gas undertakings the right to sell their coke just as they chose, but they were fortunate in being allowed to retain the control in their hands.

A Basis for Market Research

Looking to the future, the Committee was satisfied that the information and experience which was being gained in connexion with coke programming would be very valuable. Every consumer taking more than 20 tons per annum had been recorded, and that in itself would form an excellent basis for market research. The purposes for which coke was used were known, as were also the industries using it.

To relieve the shortage as much as possible every advantage had been taken of importing any coke available from other areas of supply. The existence of the levy fund had made it possible for far more coke to be imported into the area than otherwise would have been the case, the coke being sold at schedule prices. Without it the general price structure would have been materially upset, and individual consumers would have been called upon in many cases to pay prices much above the schedule. Since the levy scheme came into operation in November, 1940, nearly 2,000,000 tons of coke had been handled under the scheme. In addition it had been possible to make other arrangements rendered necessary by wartime conditions without upsetting the market price. The present fund was designed to cover the importation of coke to meet shortages, but the possibility of such a fund being used in normal times was being investigated. It might well be that they would find that a continuance of the fund would serve many useful purposes in the future development of gas coke markets.

The report recorded an increase of 7s. 6d. per ton in the price of coke during the year, and a total increase since the outbreak of war of 30s. 3d. *ex* works and 31s. 6d. delivered, all of which increases had been authorized by the Ministry of Fuel and Power. They did not meet in total the increases which gas undertakings had had to bear in their costs of manufacture and supply, mainly arising from the very large increase in the costs of coal as delivered at gas-works, but even though the increases in the price of coke had not been sufficient to meet their share of the increased costs of gas production, they had put the price of gas coke out of step with its competitors. That position would have to be faced and dealt with at the proper time.

Co-operation with Distributors

He hoped that during the coming year it would be possible to make still closer contact with their distributor friends. During the war the Executive Committee had held regular meetings with the distributors' branch, but owing to war conditions distributors in the counties had not often been called together. One of the most important matters under review at the present time by a sub-committee which was considering plans for the future was the question of merchants' margins. The Association had built up a considerable goodwill with the distributors over a period of years because it had recognized them as partners and had always promised them a fair deal. Merchants' margins had been much improved since the Association was formed, but when war broke out they were still low in many cases. The war had introduced many circumstances which might not always be apparent to members. The Ministry of Fuel and Power had recently been examining margins of coal, with the result that the distributors had been looking more closely into their own costs, and had found that in some cases coke was not bearing its proper share of the cost of distribution. He was sure that members would wish distributors to receive what was a fair and reasonable margin for selling their fuel, and this question was being examined closely.

The National Federation of Gas Coke Associations was becoming more and more firmly established. The National Technical Committee was now functioning, and consisted of representatives of Technical Committees from the various district Associations, and he was confident that it was going to perform very valuable work in the future. The work of the Solid Smokeless Fuels Federation, which linked together gas coke, hard coke, anthracite, and dry steam coals, was also assuming greater importance. He believed that Federation had a great future in seeing that each fuel took its proper place in the fuel consumption planning of the country, when greater importance would obviously be attached to the elimination of smoke. Much of the development work carried out by the L.C.C.A. prior to the war might well be strengthened if it were continued under the aegis of the Solid Smokeless Fuels Federation, and the tendency was for future development to lie in that direction.

The technical work which the Association did before the outbreak of war had been curtailed owing to the majority of the technical officers having either joined the services or been seconded to other industries ; in fact only one officer was left with the Association for that work. These technical officers were now coming back to the Association, and it was probable that by the end of the year at least half the technical staff would again be at work. The facilities of their technical service to member undertakings should then be available. Technical work in future would be closely linked with that carried out by the other district Associations through the Technical Committee of the National Federation. The L.C.C.A. took a very active part in the framing of the Federation's technical policy, and had done its utmost to foster and help the formation of the National Technical Committee and the Technical Committees attached to each of the district Associations. The machinery of this development was beginning to operate, and members of the Association should feel some sense of satisfaction in that the national technical aspect of gas coke had made considerable progress, notwithstanding the difficulties of the war years.

The testing and certification of appliances, until recently carried out by the Technical Committee of the Association, had now become the responsibility of the National Federation, and the Appliances Sub-Committee had become part of the National Technical Committee. Responsibility for the approval of appliances and the amendment and maintenance of standards in design had assumed a wider and more important significance; in fact the whole question of standardization and certification of appliances was a matter which was now concerning Government Departments, and it would seem probable that the policy originally framed and followed by the Association had proved so effective in raising the standard of appliances, that recommendations had already been made by the Fuel Efficiency Committee and other committees of the Ministry of Fuel and Power that some such system should be inaugurated to cover the whole field of solid fuel appliances if efficiency in utilization was to be maintained.

The Association was indebted to a number of members who had undertaken on behalf of the Technical Committee the testing of appliances from the inception of the approval scheme. Without their help they could not have embarked on what was then a very ambitious project, a project which had been subsequently proved to be thoroughly sound. For some time it had been clear that they could not ask those members to continue that work indefinitely. Approval in principle had been given to the setting up of a national laboratory at which testing and certification could take place. This proposal was being thoroughly explored, and it was hoped to be able to establish a central testing laboratory, possibly working in conjunction with the Gas Research Board, on behalf of the National Federation. Technical work was being developed not only through the Technical Committee of the National Federation, but also through that of the Solid Smokeless Fuels Federation. Additional value attached to much of their technical work when it was carried out in conjunction with the other members of the Solid Smokeless Fuels Federation. It undoubtedly assisted in discussing solid smokeless fuels with Government Departments and committees to be able to speak with one voice. Evidence had been given to the National Fuel and Power Advisory Council under the chairmanship of Sir Ernest Simon by the Solid Smokeless Fuels Federation which also provided a convenient organization for dealing with any matters concerning the setting up of specifications

by the British Standards Institution affecting solid smokeless fuel-burning appliances.

Degree Day Reports

Prior to the war the Association issued to its members degree day reports which were becoming very useful as a check against fuel consumption. Those reports were useful to the gas side of their Industry as well as to the coke side, in that they provided data whereby complaints of consumers on the alleged excessive use of gas or coke could be reviewed. They were compelled to cease the issue of those reports as the Meteorological Office from whom the basic data was obtained cancelled the arrangements. They had now been informed by the Meteorological Office that the wartime restrictions were removed, and that the original service could be reinstated if they so desired. With the return of members of the staff they hoped that the re-issue of those reports would start fairly soon.

The Association's activities in the agricultural field had been very fully maintained, and the designs of grass-drying plant originally produced had become universally used; in fact all the heat applications for agricultural drying processes appeared to have attached themselves almost automatically to the Association since the pioneer work it did in the early days of grass drying. They had all recently heard of F.I.D.O. This was acclaimed as a marvellous discovery for the dispersal of fog from airfields, as indeed it was. As a matter of interest he would like to remind them that the Technical Committee gave a great deal of consideration to what they christened "fog lifting" in 1937. This followed as a natural consequence to their investigations into the problems of frost prevention in orchards, and for some time the Association did its best to interest the authorities in fog lifting, and in the potentialities which lay in that for making aerodromes safe for landing in foggy weather. They did not succeed in carrying their investigations to a conclusion because of lack of interest displayed by the competent authorities, and consequently their inability to try out their suggestions on a really practical scale. It was of interest to note that F.I.D.O. represented exactly the problem in which they tried to obtain official interest as far back as 1937.

Now that the war was over the Committee had decided to go full speed ahead once more as soon as possible with technical investigations and assistance to members. They had not been entirely idle during the war, as they had constantly kept in touch with manufacturers of appliances, and several new and improved models were ready to be put on the market as soon as labour and materials were made available. They were convinced that there was a great future for coke. At the same time they realized that while coke had been easy to sell during the war years, they had lost a considerable amount of goodwill through having to supply coke made from unsuitable coals, and in sizes and of qualities unsuitable in many cases for the apparatus in which it was to be consumed. Before the war they were proceeding with a policy of developing the correct type of coke for use in every appliance coupled with technical advice to the consumer. That had in the main of course ceased during the war. There must be many users of coke who intended, when they had the opportunity, to change to other forms of fuel. They had got to see—and see at as early a date as possible—that these consumers were supplied with coke which was properly prepared and of the right quality for their use. That was a matter which could not just be done by the technical officers, but would need the full support of all members of the Association. The Committee was determined that the brake put upon the progress of coke development by the intervention of the war should be taken off, and intended to exert every effort towards that end by resuming the full activities of the Association in all directions as soon as possible.

In conclusion, Colonel Smith paid tribute to the permanent staff—to Mr. Boon, General Manager, Miss Wooster, General Secretary, and all their assistants. The past year had been a difficult one, and their work merited the highest praise.

The report and accounts were then adopted.

Miss WOOSTER presented the county nominations for the composition of the Central Committee for 1945–46.

Messrs. Cash, Stone & Co. were reappointed Auditors for the ensuing year.

On the proposition of the PRESIDENT, seconded by Mr. E. L. NICHOLAS, a vote of thanks was accorded to Colonel H. C. Smith, Chairman of the Committee, Mr. W. L. Boon, Miss Wooster, and the staff, for their services during the past year, and the vote was acknowledged by Colonel Smith, Mr. Boon, and Miss Wooster.

LUNCHEON SPEECHES

There was a large attendance at the luncheon which preceded the meeting, presided over by Mr. Frank H. Jones.

Mr. A. E. SYLVESTER, Chairman of the British Gas Council, proposed the toast of the Association, which, he said, had to face a difficult period demanding hard work and hard thinking. Its problems were not those with which commerce and industry generally were faced. In the Gas Industry coke was a residual. They did not exist for the prime purpose of producing coke for a market. It was the other way round. They had to try to find a market for a quantity of coke that was produced within certain limits, and experience up to the present had shown that they got for that coke more or less the same price as they paid for their coal. The coke they sold did not carry any of the costs of processing, and they had to consider what were the best markets they could find for it. In the coke oven industry the position was somewhat different, because there they set out to produce coke for a particular purpose for which raw coal was not suitable, and in the long run the coke they produced yielded more than the cost of the original coal. In the future there would be coke available for the general market both from gas-works and coke ovens, and the right thing to do would be to get together and try and tackle the problem in common. He was well aware that in the L.C.C.A. some very important steps had been taken in that direction. They must also bear the distributors in mind, and in the hammering out of their future policy they must take careful note of the functions and place of the distributors. He thought it would be found in the long run that there was no fundamental conflict of interests between the three parties. Much good work had been done and was being done, and he would like to pay tribute to the wonderful work that had been done by the staff of the Association, particularly Miss Wooster and Mr. Boon. They could not succeed without the support of the gas undertakings, and in that connexion he stressed the work that had been done by Dr. Hollings and Dr. Eaton, of the Gas Light and Coke Company, and Mr. Fuidge, of the South Metropolitan Gas Company.

The PRESIDENT briefly responded.

The toast of the guests was proposed by Colonel H. C. SMITH, and responded to by Mr. W. G. NOTT BOWER, Joint Deputy Secretary of the Ministry of Fuel and Power, and Mr. JOHN CHARRINGTON, Chairman of the Coke Distributors' Branch. Special reference was made to the presence of Mr. Henry Woodall, who had recently completed 60 years' service in the Gas Industry, Colonel C. M. Croft, President of the Institution of Gas Engineers, and Mr. R. W. Foot, Chairman of the Mining Association.

Institute of Fuel

The Annual Luncheon of the Institute of Fuel, at which two Melchett Medals were presented, took place at the Connaught Rooms, London, on Oct. 17. Dr. E. W. SMITH (President of the Institute) was in the Chair, and the principal guest was the Rt. Hon. Emanuel Shinwell, M.P. (Minister of Fuel and Power). There were over 600 members and guests.

Before the company sat down to luncheon, Dr. Smith mentioned that during the past 12 months the Institute had lost four prominent members—*viz.*, Mr. George Dixon (Chairman of the Midland Section), who had done so much valuable work in that area; Mr. T. Carmichael, Gas Engineer at Portsmouth; Mr. H. L. Pirie, one of the founders of the Institute; and a past-President in Sir David Milne-Watson.

After luncheon two Melchett Medals were presented. The first was to M. Etienne Audibert, who unfortunately was unable to be present owing to a motor car accident, and the Medal was accepted on his behalf by His Excellency the French Ambassador. The Chairman remarked that in 1940 the Council considered it was appropriate to present the Melchett Medal for that year to a leading fuel expert in France, and leading French scientists were asked to nominate someone who, in their opinion, was pre-eminent in fuel research in France at that time. They nominated M. Audibert, and the Medal would have been presented in October, 1940. Unfortunately, in the meantime, France was overrun and M. Audibert was taken prisoner. He was sent from camp to camp until finally, on D-Day, he was picked up by the Russians as he was being sent East.

The second Melchett Medal—that for 1945—was presented to Dr. C. H. Lander, Professor of Chemical Engineering at the City and Guilds Institute, Imperial College of Science. The Chairman recalled that Dr. Lander had been a distinguished Director of Fuel Research, following another distinguished Director, the late Sir George Beilby. It was little known, he said, that Dr. Lander initiated the true coal survey which had been so extraordinarily valuable in later years. It was also little realized that it was Dr. Lander who, before the Government took any interest whatever in hydrogenation, wiped aside all red tape and made contact with those who were developing hydrogenation on the Continent, and secured the technical rights for this country of the work that was going on, subsequently obtaining authority from the Government. That was not often done by a civil servant! Later, after much work on hydrogenation had been done at the Fuel Research Station, arrangements were made for the work to be transferred to the I.C.I., who had since done a great deal of development work. Apart from this, and the confidential work he had done during the war, in years to come it would be appreciated that Dr. Lander's chief contribution would be that of bringing together a team of men and women to develop the science of heat transmission. It was safe to say that but for the application of the work done by Dr. Lander and his team, it would not have been possible in 1942 and 1943 to have got through, without major failures, the work of producing munitions.

Finally, the Chairman presented to Mr. J. M. Austin the Student's Medal for his paper entitled "Pulverized Coal and the Modern Drop Forge."

Dr. SMITH then proposed the toast of "His Majesty's Government" and coupled with it the name of Mr. E. Shinwell (Minister of Fuel and Power), saying that Mr. Shinwell could count on everyone concerned in the fuel industries giving the maximum assistance to the

Government and its various Departments in the form of constructive proposals. In his view, the question of whether they should have private enterprise or nationalization was a minor matter, because what mattered in an industry was who ran it, not who owned it. Those running industries were the technicians and administrators, and whatever the ownership might be, if they could be sure there would be some freedom for the administrators and technicians to get on with their job, they in this country would come out well. In passing, he wondered whether the popular subject of atomic energy had yet been considered to be sufficiently important to cause the Ministry of Fuel and Power to think it advisable that they should set up some section to keep in the closest touch with the possibilities of the utilization of atomic energy for the production of power. It was too soon yet to start on elaborate development work, but he personally felt that if there was a Department or Ministry in the Government that should keep in touch with this problem, it was the Ministry of Fuel and Power.

Continuing, he said the Institute of Fuel existed to develop a fuel consciousness among the people of this country, and to assist the Ministry of Fuel and Power. He congratulated the Ministry on the invaluable work that had been done by the Fuel Efficiency Committee; that Committee had saved the country from serious fuel shortages owing to the economies and savings its work had brought about in enabling industries to carry on without their normal types of coal. The efficient utilization of any fuel depended on two factors, the technicians and the administrators, and he believed that the weakest factor in industry, and particularly in the fuel industries, was in administration and not in technique. In his view they could get through this winter readily if fuel was properly administered where it was used, not by bringing in a chemist here and a chemist there to watch CO_2, but by seeing that fuel was used in its proper way.

In conclusion, Dr. Smith said the Council had asked Mr. Pope, the Secretary, to reply to a later toast of "The Institute of Fuel," for the reason that he had been primarily responsible since 1927 for the development of the Institute. Within the next 12 months Mr. Pope would be relinquishing the position of Secretary, although he would continue to act in an advisory capacity.

Mr. E. SHINWELL (Minister of Fuel and Power), responding to the toast and referring to the statement by the Chairman that many people were surprised at the recent Labour victory, said this was nothing to the surprise that was in store for them. The Government intended for good or ill—he believed for the nation's good—to carry out its mandate. The country was faced with many grave problems, and it was the duty of everybody to make their contribution towards the solution of these great national problems. Among those problems was the effective reorganization along national lines of the fuel and power industries. The Chairman had mentioned the question of atomic energy, and what was in store for them in the future in its effect upon industry could not be said at the moment. It might be that atomic energy in the coming years—not so remote as some people might think—would lead to the scientific advancement and modernization of every department of industry. It might cause the Government to reflect and re-direct its policy in particular in relation to fuel and power, but that should not deter them from proceeding immediately with reorganization where it was required. However, he had taken note of what the Chairman had said, and perhaps he might add that if it were believed that atomic energy was likely to make the mining industry redundant in the course of the next few years, this might induce the Government to consider afresh the question of compensation.

Continuing, he said that the valuable contribution made by the fuel industries to the war effort must be projected into peace, for the fuel industries of this country, including gas, electricity, and oil, were the foundation of their future industrial prosperity. They had a vast fund of knowledge at their disposal, gained from the patient and intensified efforts of technologists and scientists in many fields, but the difficulty was in the application of that knowledge. That was where the partnership of the technologist, scientist, and politician was important, and it was a poor politician and a poor Government that did not recognize the importance of this partnership.

On the question of fuel efficiency—he disliked the word "economy"—it was only right that the nation should be asked to eliminate waste in any direction at all times, and this was specially true of their fuel resources, and he was going to make a call on the nation in this respect in connexion with his target campaign for the winter. He hoped that when the campaign began he would not only have the support of all the workpeople employed in the fuel and power industries, but of managements, scientists, and technologists, for they were all equally concerned.

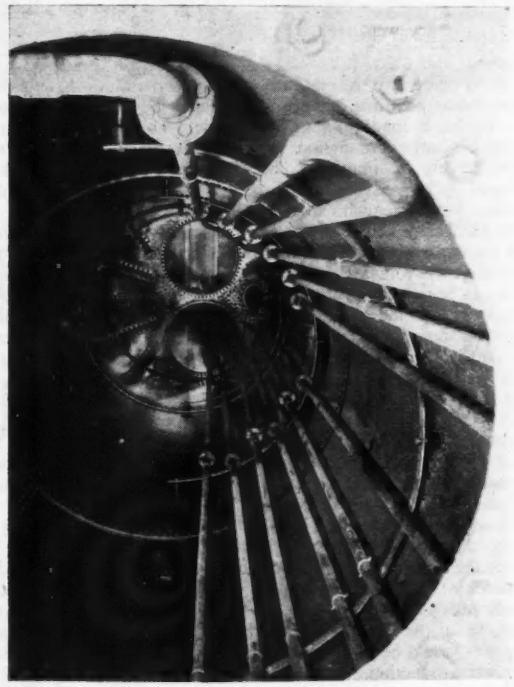
Speaking for His Majesty's Government, he said they had a mandate to proceed with a declared policy. That policy might appear to be unpalatable to many people, but the power the Government had obtained at the election must be used with the greatest reason and discretion. It must not be applied in a doctrinaire fashion. It was necessary to create in the new organization that would soon be invoked the best and highest form of administration. To that end they must seek the aid of the best people in the country. There was no question of politics, and he gave an assurance that in what the Government was about to do, apart from the mandate, they would use all the business administration and ability that was at the disposal of the nation in order to run the mining and cognate industries along national and efficient lines. It would be necessary to dispossess some of the owners, and he was really wondering whether they were not delighted that they were about to be dispossessed. The mining industry had been a very sick industry, and the owners might well be glad to be rid of it. If so, the Government was delighted to take it over. He was not going to pretend the Government could make a better job of it than the owners had made of it, but he could give the assurance that they would not make a worse job of it. Beyond that he was not prepared to go, but he gave the warning that if this project failed it would go badly for the whole nation. However, he intended that it should go well. There was ample co-operation at the disposal of the Government from the men, the management, the colliery agent, the people in the gas and electricity industries, and the Civil Service. But it had never been the intention to entrust the administration of this industry or any other industry to the Civil Service.

Dr. W. CULLEN, proposing "The Institute of Fuel"—in the absence of Mr. Robert Foot, Chairman of the Mining Association of Great Britain—said the membership of the Institute had risen from between 400 and 500 in 1927 to 2,400 at the present time. Commenting on the remark by the Chairman that it did not matter who owned an industry but who ran it, he said the really important thing was how it was run.

Mr. P. C. POPE (Secretary of the Institute) responded to the toast.

Proposing "The Visitors," he spoke of the heavy task which Mr. Shinwell and those in the Ministry of Fuel and Power had, and said that if any of the members of the Institute could be of assistance their services were at the call of the Ministry any time they were asked for.

Mr. ARTHUR HORNER (National Coal Production Officer), responding to the toast, said that a short time ago, prior to the war, he would have considered that in coming to such a gathering as this he would be entering the camp of the enemy, because those he represented regarded as an enemy anyone who contributed in any form to a reduction in the consumption of coal. Now, however, they were all allies. They were now being rapidly converted to the necessity for the application of science to coal production, and that it was a commodity too hardly won to be wasted. There was therefore now a community of purpose between those who got the coal, those who organized the getting of it, and those who had to determine the efficient use of it.



One of four large tanks for the storage of liquid glucose at constant temperature in the refinery of Messrs. Garton, Sons & Co., Ltd., of Battersea. The internal piping shown is heated by two Potterton Rex automatic gas-fired boilers with a combined output of 396,000 B.Th.U. per hour.

The Manchester District Association of Gas Engineers will meet in the Demonstration Theatre of the Manchester Gas Department at 2 p.m. on Oct. 26, when Mr. R. J. Bradshaw, Deputy Engineer and Manager of the St. Helens Gas Department, will present a Paper on "Use of Town Gas in the Glass Industry." The Paper will be supplemented by films.

Atomic Energy

[Specially Contributed]

Since the publication in the "Journal" of Aug. 29 and Sept. 5 and 12 of three articles on atomic energy there has become available a report by H. D. Smyth entitled "A General Account of Methods of Using Atomic Energy for Military Purposes under the Auspices of the United States Government, 1940–1945." Although the details in this report are naturally not complete, it nevertheless provides so much new information on the subject of the utilization of atomic energy that it seems worth while to give some account of it.

IT was explained in the previous articles that the release of atomic energy comes about by the splitting of a heavy nucleus into fragments whose total mass is less than the mass of the original nucleus. Each gramme of mass that disappears is converted into the equivalent of about 2×10^{13} calories of energy. The practical problem is to make this process self-sustaining in either a controllable or an uncontrollable manner.

In 1940 it was known that nuclear fission in uranium could be produced by either fast or slow neutrons. Slow neutrons could cause fission in the uranium isotope U_{235} but not in U_{238}, whereas fast neutrons could cause fission in both, but were not as effective as slow ones for U_{235}. Neutrons of intermediate speed could be captured by U_{238} without fission to produce another isotope of uranium, U_{239}. Later it was established that the U_{239} isotope was unstable, and that after about 20 minutes from its formation half of it had changed by emission of a β particle into neptunium, an element of atomic number 93, which was not previously known in Nature. This element also is unstable and emits a β particle to form another new element known as plutonium. Plutonium has mass 239 and atomic number 94 and, like U_{235}, can undergo fission when bombarded by slow neutrons. Its production from uranium formed one of the major projects carried out by nuclear physicists in U.S.A.

Nuclear Chain Reaction

The possibility that the process of nuclear fission should be a self-sustaining or "chain" reaction depends upon the fact that as a result of the fission neutrons are produced which may be able to disrupt other nuclei, if conditions are favourable. These neutrons may (1) escape, (2) suffer non-fission capture by uranium, (3) suffer non-fission capture by impurities, or (4) cause fission. The neutrons produced by process (4) must exceed those lost by the other three processes for the reaction to be self-sustaining.

The number of neutrons escaping from the mass depends upon the surface area, whereas the number of fission and non-fission captures depends on the volume. Therefore the number of neutrons that can escape can be reduced by increasing the size of the mass, thus reducing the ratio of area to volume. The critical size of a device containing uranium is defined as the size in which the production of neutrons by fission is just equal to the loss by escape and non-fission capture.

The neutrons formed by nuclear fission are ejected at high speeds, but it is slow neutrons that are most effective in producing fission of U_{235}. Therefore, in order to increase the probability of fission the neutrons must be slowed down before collision with the nuclei. This is best done by collision with a light element which does not absorb neutrons. Fermi and Szilard suggested that for this purpose lumps of uranium should be embedded in a matrix of graphite. The neutrons leaving one lump would be slowed down sufficiently by passage through the intervening carbon to cause fission when they reached the next lump. Such a device would not require the previous separation of the uranium isotopes, because natural uranium would contain sufficient U_{235} to keep the chain reaction going by nuclear fission, while the U_{238} would be gradually converted to plutonium. Since heat would be produced by the reaction there were possibilities for power production. On the other hand, for the more immediate military purposes it was realized that the production of an atomic bomb would require the difficult separation of U_{235} from its isotope U_{238} or, alternatively, the production of plutonium. The plutonium would be formed from U_{238} in the manner described, and could be separated from other elements by theoretically easy chemical means. The two major projects of the separation of U_{235} and of the production of plutonium were vigorously pursued.

Production of Plutonium

In July, 1941, the first lattice structure of graphite and uranium, called a pile, was set up at Columbia University. It was a graphite cube of about 8 foot side, and held about 7 tons of uranium oxide in iron containers distributed at equal intervals through the graphite. In such a pile there are sufficient free neutrons to start the reaction, but whether the reaction is sustained or not depends upon the ratio of neutrons formed by fission to those originally present being greater than 1.00. This ratio is known as the multiplication factor, k. Measurement showed that the value of k was only 0.87. But in spite of the disappointment it was agreed that success might be achieved by using purer materials and different lattice arrangements. The material used for slowing down the neutrons was graphite and is known as the moderator. The use of beryllium and heavy water as moderators was also investigated.

As the result of the production of much purer uranium and graphite the first self-sustaining pile was put to work at Chicago on Dec. 2, 1942. But the heat produced in the reaction was only equivalent to 200 watts, whereas it was calculated that the energy given out by the formation of a kilogramme of plutonium per day would be about a million kilowatts.

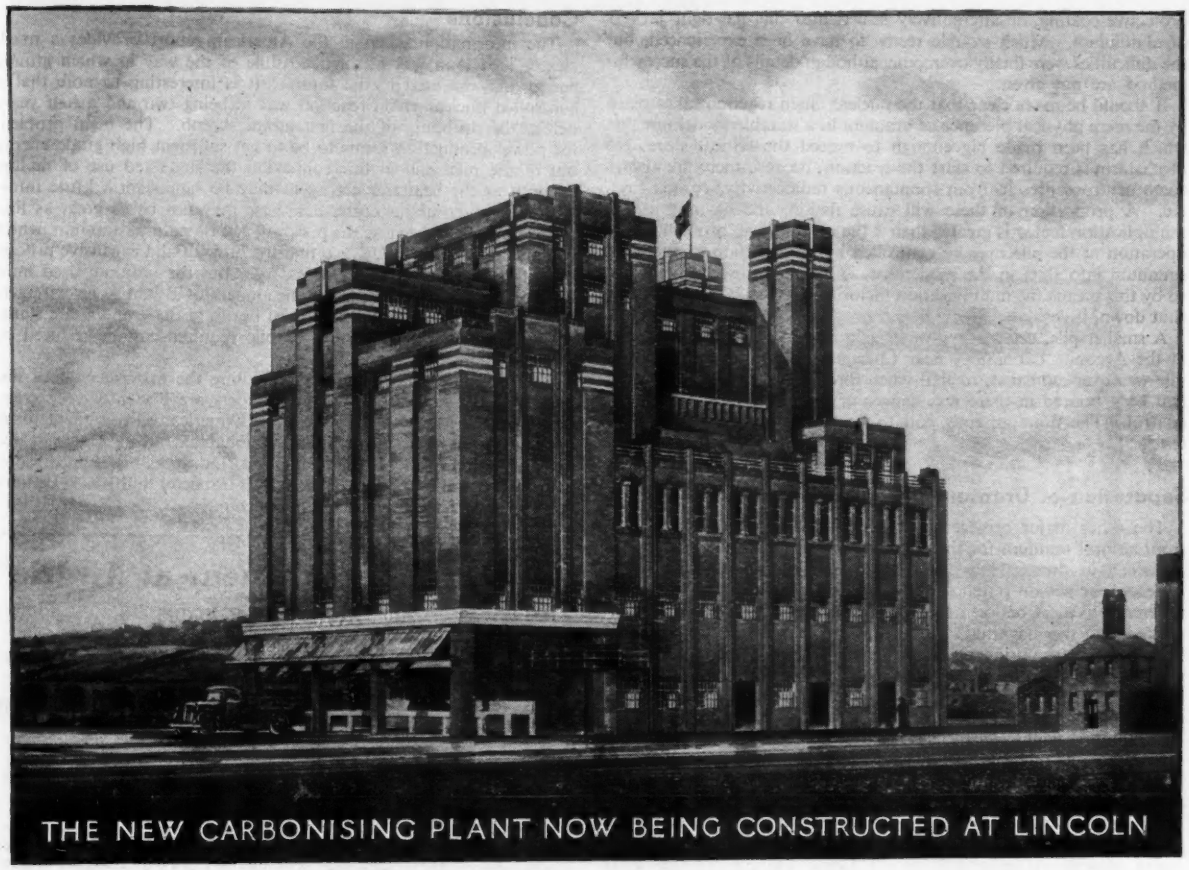
Large Scale Plant

From the information obtained at Chicago it was decided to design a large-scale plant straight away without waiting for the completion of a semi large-scale plant which was then being built at Clinton, Tennessee, mainly for the investigation of the methods for chemical separation of plutonium from the other substances formed in the pile. Since very large quantities of heat would be produced in a large scale plant, means of cooling the pile would have to be considered. The best cooling agents were thought to be helium, water, or molten bismuth. In the end it was decided to use water cooling and to build the plant near the Columbia River at Hanford. The du Pont Company were to be the constructors.

The water had to be conveyed through the pile in a material which would not absorb neutrons and which would also not corrode. The material chosen was aluminium. The water used could not be returned direct to the river because of the danger of pollution with radioactive substances formed by the fission and by the intense radiation of the pile. A large reservoir had to be built to store the water long enough for the radioactivity to die down. The pile itself had to be surrounded by thick walls of concrete in order to protect the workers from the radiation, and all operations carried out by remote control. The uranium in the form of rods was put into channels cut in the graphite, so that when sufficient plutonium had been formed the rods could be pushed out from behind shields and new rods inserted.

The chemistry of plutonium had been investigated on a few milligrammes prepared in the laboratory, but practical methods for its separation were worked out at Clinton. This plant ran at about a thousand kilowatts, and by March, 1944, several grammes of plutonium had been prepared. Chemically plutonium may be regarded as a member of a new "rare earth" series which starts at uranium. It has valencies 3, 4, 5, or 6, and the method of separation used makes use of oxidation and reduction processes. It has to be separated from unchanged U_{238} and also from the various fission products of uranium, of which there are about 30. These substances are radioactive and highly dangerous, particularly as some of them are gaseous. Even air in contact with the pile becomes radioactive, so that the shields have to be air-tight. The whole problem of safety and disposal of dangerous products is therefore a major one. It was decided to carry out the separation by remote control in heavily shielded vessels almost sunk into the ground.

Work on the large scale plant at Hanford was begun in June, 1943, and the operation of the first pile began in September, 1944. Three piles were working in the summer of 1945. The output is not stated, but is said to be very large. One thousand square miles of land were taken over by the U.S. Government, and at the peak of activity in 1944 there were 60,000 people in specially built camps. One of the major technical difficulties was the protection of the uranium rods from the action of the cooling water. The rods had to be given a



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protective coating, or alternatively sealed into this gas-tight jackets of aluminium. Much trouble seems to have been experienced, but the difficulties were finally overcome, although details of the successful method are not given.

It should be made clear that the nuclear chain reaction takes place by the mere physical presence of uranium in a suitable moderator pile which has been made big enough to exceed the critical size. No mechanism is required to start the reaction, because there are always some neutrons present from spontaneous radioactivity, cosmic rays, &c. A proportion of these will cause fission, and as long as the multiplication factor is greater than 1 the reaction will proceed. The operation of the pile may be controlled by the insertion of sheets of cadmium into slots in the moderator. Cadmium absorbs neutrons, so by this means the multiplication factor can be reduced and the pile shut down, if desired.

A smaller pile, using heavy water as a moderator, was constructed at the Argonne Laboratory near Chicago. The critical size of this pile was over-estimated, so that when three-fifths of the heavy water had been poured in there was danger of the reaction getting out of control. The uranium rods had to be hastily removed to prevent disaster!

Separation of Uranium Isotopes

The other major project undertaken was the separation of U_{235} from natural uranium for the construction of the atomic bomb. As explained in the previous articles, isotope separation depends not on chemical but on physical processes which make use of the small difference in mass between the isotopes. Several methods were considered, and the magnitude of the problem may be illustrated by the fact that the separation by centrifuging of one kilogramme of U_{235} per day would require 22,000 high speed centrifuges each 3 ft. across. A pilot plant on this principles was constructed, but on the large scale most of the U_{235} prepared was separated by gaseous diffusion of uranium hexafluoride. The gas was pumped through a porous barrier such as might be obtained by etching a silver zinc alloy with hydrochloric acid. Many acres of barrier were required which had to contain millions of holes not larger than 10^{-6} cm. The number of stages required numbered many thousands, and only half of the gas passing a given stage was allowed to pass to the next, the other half being recycled. The amount of gas forced through the first stage was about 100,000 times the amount of that which emerged from the final stage. Owing to the corrosive nature of the gas, sealed pumps had to be used and the whole system had to be vacuum tight. The plant was constructed in Tennessee, near the Clinton plutonium plant, and was in successful production before the summer of 1945.

Another method used was that of magnetic separation under the direction of E. O. Lawrence, the inventor of the cyclotron.

The method is a large scale application of the principles of the mass spectrograph originally invented by Aston for the investigation of isotopes. A stream of charged uranium particles is passed through a slit and the path of the stream bent by a strong magnetic field, the degree of bending depending on the mass of the particles. Collecting pockets are placed in the appropriate position to collect the products. The magnet from the large Berkeley cyclotron was dismantled and used in this method. It has a pole diameter of 184 inches and a pole gap of 72 inches. A starting material enriched in U_{235} for use in this apparatus was obtained from a thermal diffusion plant using a liquid separation method.

The Atomic Bomb

Work on the actual design of the atomic bomb was carried out at Los Alamos in New Mexico. An atomic bomb requires an explosive and not a controlled nuclear chain reaction. Consequently the non-fission capture of neutrons by U_{238} must be prevented, and this involves the separation of U_{235} or the use of plutonium. Early reports on the working of the bomb (including my own) seem to have been wrong on two points. Firstly the explosive nuclear reaction depends primarily on the fission of the nuclei by fast and not by slow neutrons, because the maximum possible number of nuclei must be fissured before they are dispersed by the explosion. Secondly, no external source of neutrons, such as would be provided by radium and beryllium, is necessary to start the explosion. The bomb will explode by the mere bringing together of a sufficient mass of U_{235} so that the critical size is exceeded. The speed of assembly must be quick enough to bring the masses together to the most favourably compact form before the explosion drives them apart again. Full details are naturally not given, but it seems that the component parts are actually fired into one another, so that the critical size is reached and the explosive nuclear chain reaction then occurs.

Conclusions

The information given in the American report provides a much clearer idea than was hitherto possible of the way in which atomic energy may be used in the future. It is interesting to note that a controlled nuclear chain reaction was in being two and a half years before the dropping of the first atomic bomb. The main problem for power production seems to be to get sufficient high grade energy out of the pile, and in this connexion the suggested use of molten bismuth as the heat transfer agent may be significant. Little information is given about costs, but these may not be as great as first reports indicated, because the piles will run on natural uranium, which contains only 0.7% of U_{235}, so that the difficult and expensive process of isotope separation is not necessary. But the uranium used must be freed from other elements and the moderator also must be extremely pure. Thus two parts per million of boron in the graphite are stated to be objectionable. The size of pile required can be reduced by using uranium enriched in U_{235}.

The difficulties and dangers of handling the material and of disposing of the radioactive fission products are evidently very great. It was a wise move on the part of the American Government to set up the first big plant in an almost uninhabited area. One can well imagine that the sins of older established industries may appear comparatively venial in the eyes of the Alkali Inspector and River Authorities if the process is ever set up in this country. E. M. H. B.

Wartime Development at Airdrie*

By DAVID L. DICKSON
Gas Engineer, Airdrie

(*Concluded from p.* 541)

The price of gas has been decreased to the domestic consumer from the price ruling in 1940–1941 as follows:

	1940—1941.		1944—1945.	
Domestic	Slots. s. d.	Ordinary. s. d.	Slots. s. d.	Ordinary. s. d.
Airdrie	5 2	4 9	4 0	3 9
Outer areas	5 5	5 2	4 0	3 9

Decreases ranging from 1s. to 1s. 5d. per 1,000 cu.ft. have been made. An industrial load has been built up from 6 millions per annum, or 4.4%, in 1938–39, to 70 millions per annum, or 28.7%, in 1943–44, the average selling price of which was 2s. 2.7d. per 1,000 cu.ft., or 6.28d. per therm.

The following table illustrates how our manufactured gas output was made up for 1943–44. (*N.B.*—Whilst our financial year finishes on May 15, the last survey quarter for that year finishes on July 31, so that it was impossible to give figures for 1944–45, when this paper went to press):

1943—1944.	Cu.ft.	%
Ordinary gas sold	38,543,200	15.22
Industrial gas sold	70,153,200	27.70
Used on works	1,530,800	.61
Slot gas sold	124,829,700	49.29
Public lighting	6,226,600	2.46
Unaccounted	11,958,500	4.72
	253,242,000	100.00

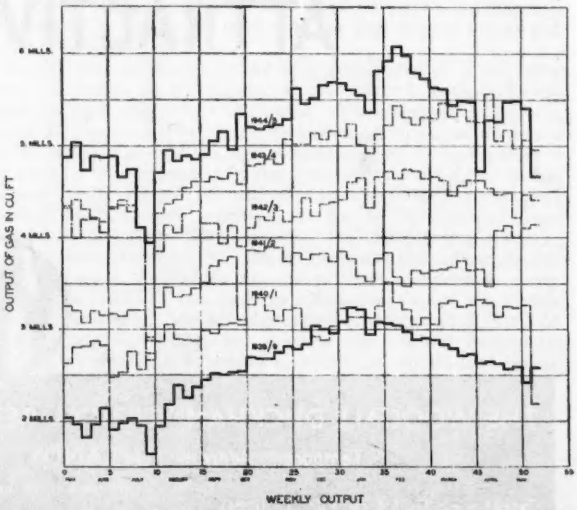

FIG. 7.

* Paper to the North British Association of Gas Managers, Sept. 7.

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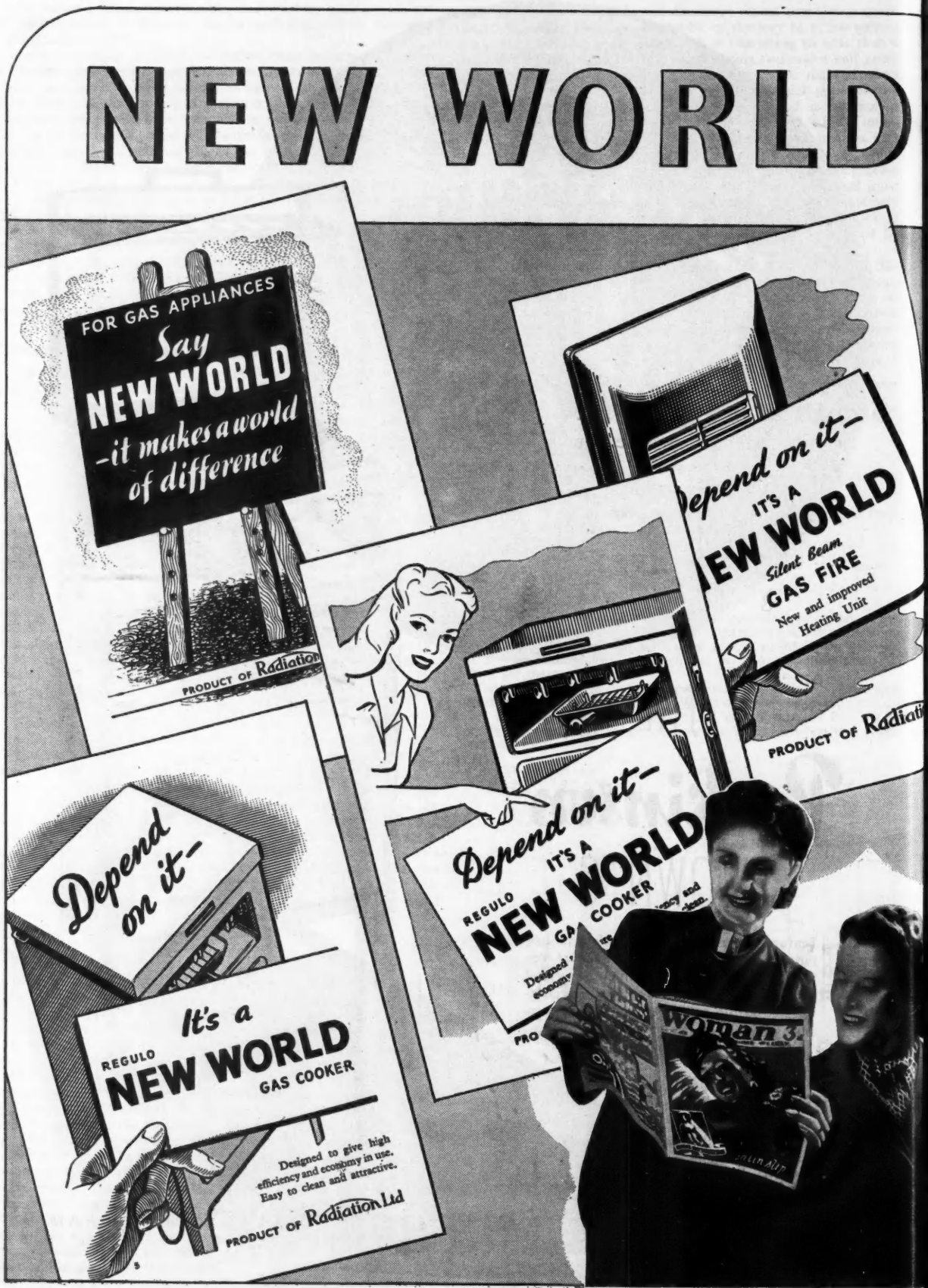
Features include : Hotplate with 3 boiling burners and grill. "Ajusto" Automatic Oven Heat Regulator, ample oven capacity and white porcelain enamel cover top, incorporating folding plate rack. Attractive in appearance, practical in design and easy to clean.

THE PARKINSON STOVE COMPANY LTD. STECHFORD BIRMINGHAM 9

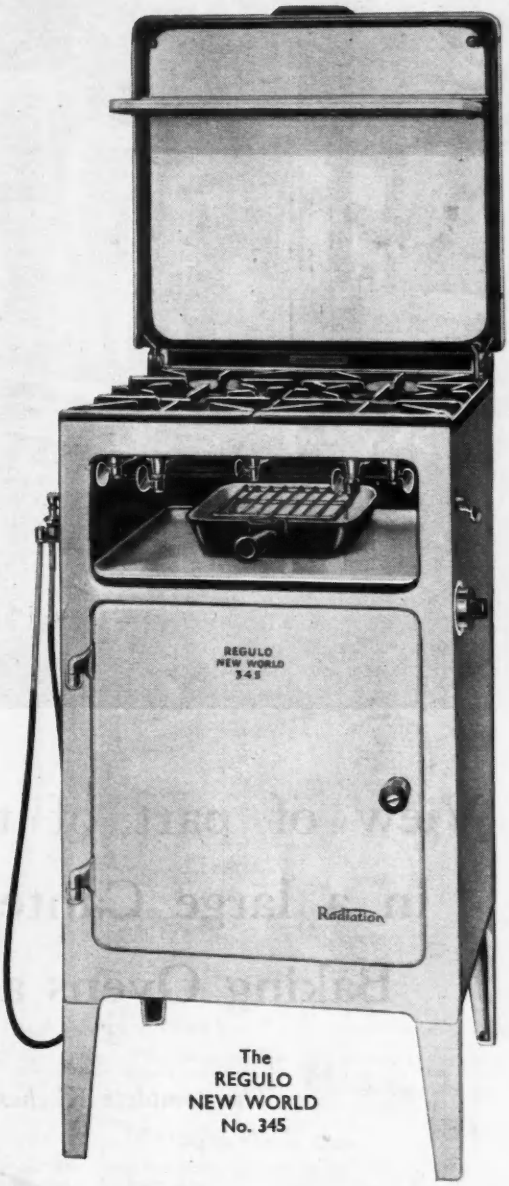

NEW WORLD
FOR GAS APPLIANCES
Say
NEW WORLD
-it makes a world of difference
PRODUCT OF Radiation
Depend on it-
IT'S A
NEW WORLD
Silent Beam
GAS FIRE
New and improved Heating Unit
PRODUCT OF Radiation
Depend on it-
REGULO
NEW WORLD
GA COOKER
Depend on it-
It's a
REGULO
NEW WORLD
GAS COOKER
Designed to give high efficiency and economy in use. Easy to clean and attractive.
PRODUCT OF Radiation Ltd
Woman

-the housewife's charter!

To free the housewife from drudgery, whilst at the same time cutting down maintenance cost to the Undertaking, has always been a foremost consideration in the development programme of Radiation Ltd. The change from war output to the supply of domestic equipment is proceeding under difficulties, which every effort is being made to overcome.

Meantime, Radiation advertisements are regularly appearing in the important women's magazines, daily and Sunday newspapers, etc., as they have done during the War period, so that the advantages of Gas for domestic uses will be kept constantly in mind by the Public.

Some recent examples of these advertisements are shown opposite.



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NEW WORLD
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NEW WORLD
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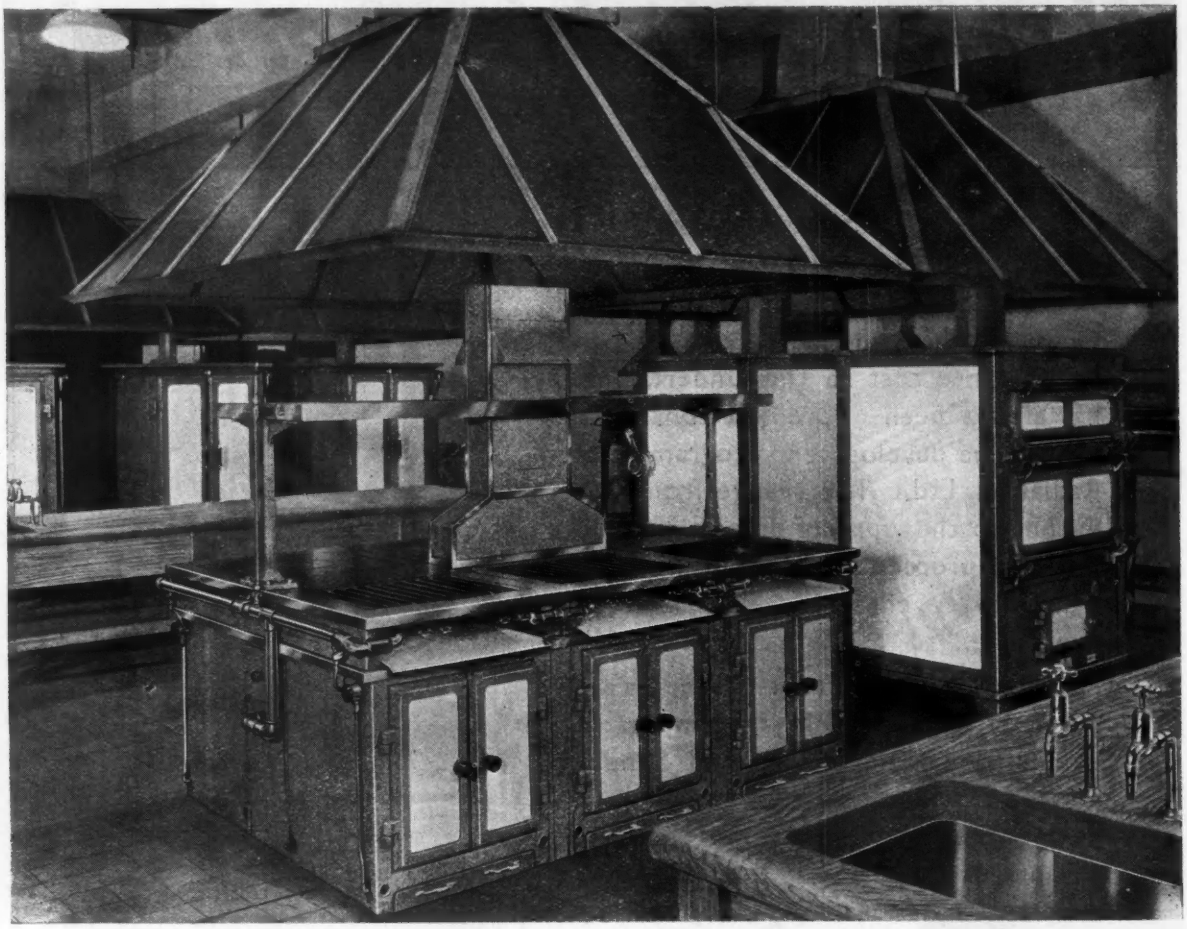
LARGE-SCALE APPARATUS FOR THE COOKING AND SERVING OF FOOD



View of part of the Principal Kitchen in a large Canteen, showing Range, Baking Ovens and Roasting Ovens

The complete Kitchen planned and equipped by

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Capital Indebtedness and the Industrial Load

The outstanding capital debt has altered from £20,734, or £152 per million made in 1938–39, to £34,880, or £127 per million made in 1944–45 (fig. 7).

The prospects of our industrial load increasing are extremely bright, since most of the large consumers are peacetime manufacturers who themselves were badly hit when rationing commenced, and provided we can supply a reasonably priced industrial gas we are assured of their support. One industrial consumer alone has reached the remarkable low rate of charge of 1s. 10d. per 1,000 cu.ft., or 5.17d. per therm for town gas. Whilst we do not want to overbalance by selling too much cheap gas, it must nevertheless be remembered that once the cost into holder has been met plus a reasonable addition made for capital outstanding and other distribution charges, then the large consumer is paying his way by the mere fact that the cost per 1,000 cu.ft. into holder is substantially reduced through his large consumption.

Our manufacturing plant is in excellent condition, being only five years old. Our ancillary plant is reasonably good, and our works site is uncongested. Cost sheet (fig. 5) shows how our working costs have been consistently reduced throughout the years, despite increases in the cost of coal from an average price of 23s. 1.8d. per ton in 1938–39 to 33s. 8.2d. per ton in 1943–44, whilst carbonizing wages, despite increases, have been reduced from 6.07d. per 1,000 cu.ft. of gas sold in 1938–39 to 2.27d. per 1,000 cu.ft. of gas sold in 1943–44, whilst the efficiency of our plant as a carbonizing medium is demonstrated by the fact that our fuel index is in the region of 24, and is among the lowest in Scotland.

We have not reduced our price of gas below an uneconomic figure to any consumer, and have purposely kept our price to the domestic consumer at a rate which prevented our having to increase the price of gas if costs of coal, wages, &c., took an upward bound. This means that even without legislation we can introduce an optional service charge or a sliding scale charge, and so sell gas at a lower price to large domestic consumers, whilst regaining from the small consumer at least some payment towards his capital commitment by means of the initial higher charge

We have reasonable reserves to meet any large demand including war damage insurance, which, as you will observe, has been budgeted for as far back as 1941–42. It would therefore appear that if we can hold our domestic market in face of the severe competition which we know is brewing, then we can look forward to prosperous years ahead. We need have no doubt of this if reasonable freedom of choice is allowed, and no monopoly granted to other forms of heating and power.

Further Extensions

Airdrie Town Council have had sufficient faith in their gas undertaking to contemplate further increases in output, and as you will see from the future plan of the works site (fig. 8), arrangements have already been completed to increase immediately the existing carbonizing capacity by another four retorts, at the same time building the retort house, foundations and steelwork, including bunkers and conveyors, to allow of a further four going down immediately they are required. It is anticipated that this work, which has been placed with Messrs. West's Gas Improvement Co., Ltd., of Manchester, will be commenced before the end of the present year, and we hope that it will be producing gas early in 1946. Outstanding features in the new arrangement will be the increasing use of recording instruments, and it is hoped to have those instruments grouped on one panel on the stack platform, so that they can all be easily seen and checked.

Condenser and Electro-Detarrer

A contract has also been placed with Messrs. Henry Balfour & Co., Ltd., of Leven, for the supply, delivery, and erection of a 2 million water-cooled vertical tube condenser and for an electrical detarrer of the same capacity. From the site plan it will be observed that the condenser will be placed inside the old horizontal retort house. It is our intention to dismantle the existing vertical four-pass scrubber (already shown, fig. 3), and on its present site place the electrical detarrer. The existing vertical scrubber will then be split and one new top and bottom cast iron reservoir made. In this way, by providing another two pumps, two units will be made out of one, and in so doing the capacity of the twin scrubber will be made approximately 2 million cu.ft. per day. Provision has also been made to allow a Livesey washer being installed. By making those adjustments in position we shall clear up the presently congested site in our lower yard and obtain a much better general layout and working conditions.

When these arrangements have been finally carried out the capacity of our carbonizing plant will be 1,600,000 cu.ft. per day, with a 500,000 cu.ft. water gas plant in reserve to meet exceptional circumstances, such as repairs, peak loads, &c.

Further schemes being considered are the expansion of our railway siding and the conversion of the Lancashire boiler to mechanical firing.

Personnel

One of the outstanding successes of our new plant is that we have doubled the output from our works in six years with actually a lesser number of personnel employed, as is shown by the following table:

Designation.	May, 1939.	May, 1945.
Engineer and Manager	1	1
Office Staff	2	3
Meter Collectors	3	4
Works Superintendent	1	1
Stokers	8	6
Boilermen	2	
Water Gas Plant Operators	2	1
Labourers	10	8
Carter or Driver	1	1
Distribution Foreman	1	1
Gasfitters	8	4
Gasfitter Apprentices	0	2
Lamp Attendants	4	3
Technical Assistant	0	1
Telephone Operators	0	2
Working Foreman	0	1
Plant Attendant	0	1
M. & S. Layers	0	0
	43	40

An examination of this table shows that the office and technical staff has gone up, whilst our working staff has gone down. This, of course, is due firstly to the fact that we were initially understaffed in the office, and also because statistical control has been advantageously increased both in the works and the district.

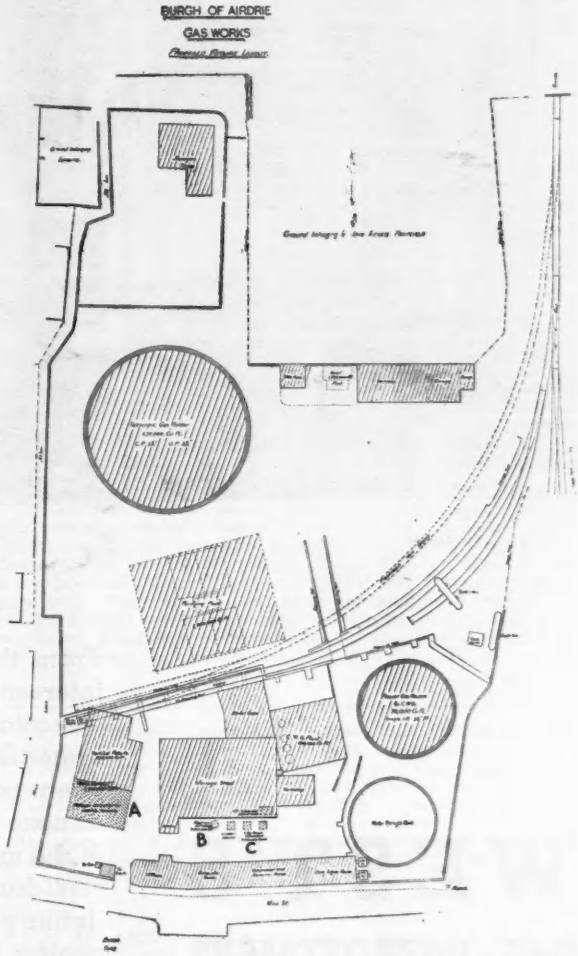


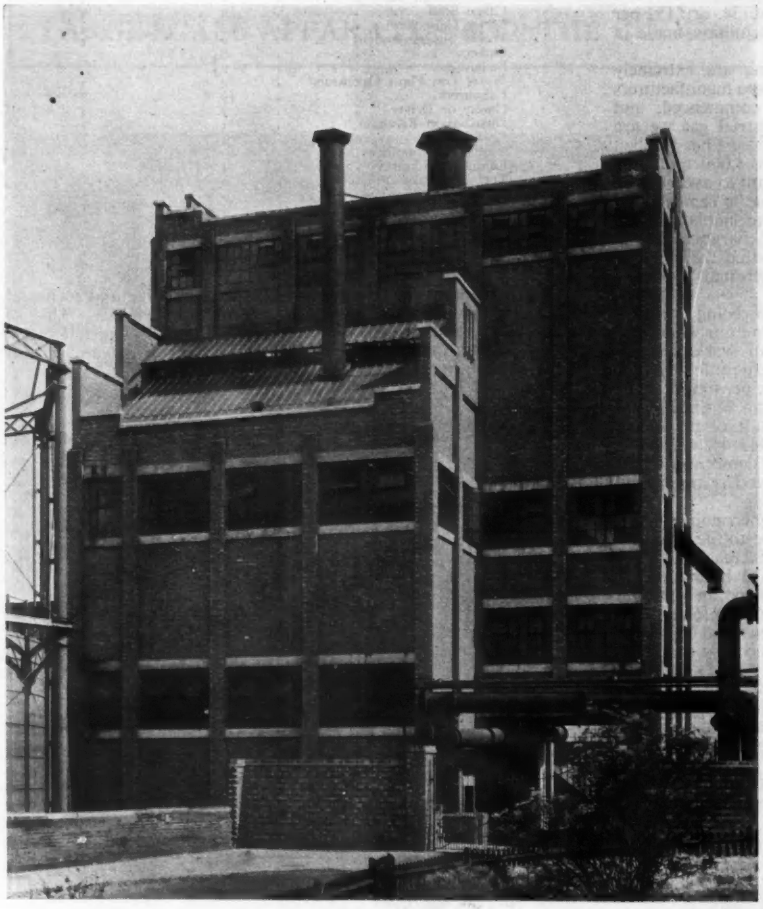
FIG. 8.—*Burgh of Airdrie Gas-Works. Proposed future layout.*

A. Proposed Extension of Vertical Retorts, making total capacity 1,600,000 cu.ft.
B. Electrical Detarrer, 2,000,000 cu.ft.
C. Livesey Washer; two Square Tower Scrubbers, 2,000,000 cu.ft. each.

Coke Oven Gas

So far this Paper has been confined to the manufacture and supply of town gas. We have, however, for the past two years been supplying crude coke oven gas within our area of supply, and in 1944–45 our sales of coke oven gas of 500 B.Th.U. amounted to 66,203,000 cu.ft. This, on top of gas manufactured for that year, means that our total thermal output for 1944–45 was 1,493,003 therms, compared with 579,891 therms for 1938–39, *i.e.*—an increase of 157%.

This gas was used solely for war work, and was brought into our area to serve one large factory. The layout of mains at this point was such that both coke oven gas and town gas were laid on to two



GLOVER-WEST

Vertical Retorts

at

HIGH WYCOMBE

ARCHITECTURAL FEATURES

From the layman's point of view, perhaps the most interesting feature is the attempt to produce in an essentially industrial building a pleasing architectural appearance. The steel frame-work of the building has been encased in brickwork, and the coal-receiving annexe and coke hoppers are built as integral features of the main building. A liberal use has been made of steel-framed windows for producing maximum natural lighting and ventilation. Parapets with "Snowcrete" coping form a pleasing finish to the skyline. Rain-water pipes are not visible, being taken down internally. The full effect of the building when viewed from Desborough Road is masked to some extent by the abutment of the old horizontal retort house, but when this is dismantled and the new retort house extended it will appear as an independent and symmetrically designed structure.

WEST'S

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12,000 cu.ft. per hour B.M. meters, and so long as coke oven gas was available it was used.

In the event of cessation of coke oven supplies it was a simple matter to open up the town supply, which as well as being valved off was also spaded off to prevent foul gas going on to our district. On one occasion, owing to cessation of coke oven gas we carried this factory on our Works load for three days; coke oven gas was shut off at four o'clock in the afternoon and town gas was being used by seven o'clock. It might have been expected that with the difference in C.V. and pressures, *i.e.*—coke oven gas at 10 in. pressure and 500 B.Th.U., and town gas at 4 in. pressure and 425 B.Th.U.—the working of the plant would be upset, but this was not the case. Apart from readjustment at the burners no difficulties resulted. The burners, of course, had actually been installed to deal with town gas of 425 B.Th.U. at a pressure of no less than 2 in. W.G. at the burner. Figures given by the management of the factory showed that there was no appreciable difference in the number of therms used. The results returned to us for the same number of furnaces in use over a similar period were:

Coke oven gas	70 therms.
Town gas	67 „

No reliable conclusion could be arrived at, however, since the weight of material treated differed and no figures could be disclosed owing to the nature of the work involved.

Our experience has shown, however, that where crude coke oven gas is used, governors and controls generally must be cleaned regularly in order to overcome the ever prevalent gum. It is indeed doubtful if the slight difference in cost between crude gas and purified gas makes it worth while distributing the crude, since apart from gum troubles, which can be serious, there are always the sulphur fumes, which, although they might be tolerated in war, should be removed in time of peace, even for factory work. If not, they are only going to give gas a bad name as a smelly, obnoxious fuel, and this in turn reacts against us in the domestic field.

Conclusion

The need for fuel conservation is now more than ever of paramount importance. The European War has brought out in sharp relief the need for vigilance in the use of our fuel resources, and only those who can efficiently use fuel will be able to withstand the economic strain of using coal at the high prices resulting from the war, and likely to rule for some time. It is imperative therefore that the gas engineer should view gas manufacture in this light, and in constructing new plant or reconstructing old, remodel his ideas to incorporate the highest thermal efficiency in production, remembering that a low producer fuel figure is the key to the balance-sheet of carbonization, be it thermal or economic. The adage is still true "that profits are made or lost in the retort house," but it must also be remembered that the same can apply to any branch of our work. Profits made must also be wisely spent to ensure that our products, gaseous and solid, are properly and thoroughly treated and made ready for consumption, and a market created for them by skilled, well paid personnel trained to meet the needs of the domestic, semi-domestic and industrial users of gas.

As one of the largest and most efficient users of coal it is imperative for the future welfare of the nation that both the Gas and Coal Industries get together and have a common understanding, co-operating in the efficient utilization of coal and the development of a common fuel policy. That *much* can be done and will be done, provided we reach agreement, can be visualized by the fact that very little has so far been accomplished towards making our cities the smokeless dreams we would have them.

DISCUSSION

Mr. **Ernest West** (Managing Director of West's Gas Improvement Company Ltd.) said one could not fail to be interested in Mr. Dickson's emphasis on the importance of what he had called practical scientific control. The necessity for research had been very fully emphasized during the past few years, but it was necessary to discriminate between the various types of research which could be undertaken. For instance there was fundamental research. This was chiefly the scientific investigation of the principles upon which their processes were based. It might appear to have only a very remote and not always very easily recognizable connexion with the processes themselves, but its importance could not be overrated. Then there was the development of new processes and the application of these in practice, which was mainly the concern of the manufacturers of the plant and appliances involved.

But the type of research which was so clearly emphasized in Mr. Dickson's Paper, practical and applied research, was of equal importance. Clearly, research could not yield beneficial results in the Industry unless the new plant and appliances were worked under the scientific control of competent operators. It was therefore open to all of them to practise scientific methods in a scientific spirit in whatever sphere they were employed in their great Industry.

On taking over at Airdrie Mr. Dickson was faced with a very difficult position, and they all admired the energetic and capable steps he took in dealing with it. He had shown how necessary it was in the first place to study the problem carefully as a whole, and then to proceed step by step in detail in the development of the several processes, aiming at higher technical efficiency, at the same time endeavouring to improve the working conditions of the operatives.

The Author had succeeded to a remarkable degree. He had set out in his Paper the results of his careful study, emphasizing the importance of reliable data, regularly and systematically recorded, upon which his practical measures were based. His appreciation of the value of instruments, when kept in good working order and properly calibrated, would be approved by all. Such instruments were the silent witnesses recording the evidence of prevailing conditions. If these records were regularly and intelligently interpreted, decisive and effective action could be taken to deal with any variations. Such action should be promptly taken, whether searching for improved results or rectifying abnormal conditions.

In the choice of instruments the qualities required were robustness of construction, effective enclosure leaving easy access for cleaning, adjustment, and maintenance, aiming rather at a consistent indication of variation from the normal than at a high degree of accuracy. Throughout the reconstruction of the various parts of the works under Mr. Dickson's control one saw evidence everywhere of careful study and the application of truly scientific principles. It was "research" of this kind which produced quick returns and an improvement in the balance sheet. Research in the industrial field was also emphasized in this highly practical Paper. Nothing could be more important at the present juncture, for he was convinced that the future success of the Gas Industry was bound up with the supply of gaseous fuel to the multitude of industrial processes requiring heat treatment of any kind.

Mr. **E. G. Smith** (Dunfermline) thought the interpretation of results should include the financial results. Knowledge of the physical characteristics of coke was essential, and coke screening plant was necessary. There was a lack of accurate information regarding the costs of coke screening, and he looked forward to the time when Mr. Dickson's figures would be available. The Paper showed how plant could be adapted to meet an increasing load.

Mr. **James Bell** (formerly of Dumbarton) said that the Author had found the Airdrie plant dilapidated and had modernized it with skill.

Mr. **A. Brown** (Alloa) thought that variations in heat would occur due to bad resetting after the nozzle being cleaned so often. Airdrie maintenance costs seemed high, due possibly to heavy repairs. The cost of carbonizing was less at Alloa, but possibly certain items were included in the Airdrie costs which did not appear in those of Alloa. The income tax item at Airdrie was also heavy. Most of them would envy the low capital debt at Airdrie. Reference was made in the Paper to electric de-tarrers. He had experience of these for the past five years, and they gave excellent service and were 99% efficient. At Alloa they could cover the purification costs by the re-sale of spent oxide.

Mr. **Dickson**, replying, agreed that the physical characteristics of coke should be carefully studied by gas engineers. In answer to Mr. Brown, they cleaned the nozzle often in order to prevent heat fluctuations. If they cleaned the nostrils on one side one day and then, a few days later, cleaned those on the other side, they got extremely good heat. They worked their plant continuously at Airdrie and could not afford to take risks. Five years, normally, was not a good life, but they had to remember the class of coal they got during the war. He hoped to have an electric detarrer in operation within a few months.

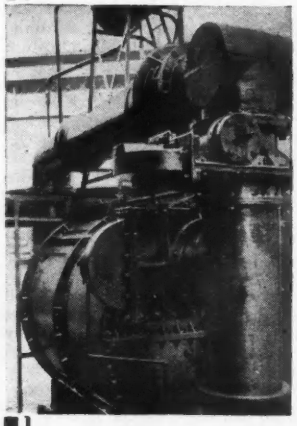
The Underpressure Engineering Company, Ltd., Union Foundry, Mansfield, announce that they are opening a London Storehouse at Vale Royal, King's Cross, N. 7, where they will keep stocks of their various products, split collars, underpressure connexions, tools, &c., for the facility of their many customers in the Home Counties and the South of England.

The Accounts of the Metropolitan Gas Company of Melbourne for the year to June 30 just to hand show a profit of £173,304, compared with £170,954 for the previous year, and a final dividend of 5s. per share, the same as before, leaving £96,131 to be carried forward against £90,952 brought in. Operating results for the year show that 443,257 tons of coal (against 418,114 tons) was carbonized, 7,785 million cu.ft. of gas (against 7,157 million cu.ft.) was made, producing 292,235 tons of coke (against 278,277 tons), 7,771,437 gall. of tar (against 7,156,836 gall.), 1,353 tons of sulphate of ammonia (against 1,425 tons) and 1,120,080 gall. of ammoniacal liquor (against 1,560,700 gall.).

Over 702,000 People attended the Homes for To-morrow exhibition arranged by the *Yorkshire Evening News* at Leeds last month, at which the United Kingdom Gas Corporation staged the attractive gas exhibit described in the "JOURNAL" of Sept. 5. A "General" gas cooker was given by the Corporation as first prize in an opinions contest in which there were 6,800 entries, and a number of gas pokers, supplied and fitted free, were awarded as consolation prizes. The exhibition kitchen has been taken to the Wakefield area of the West Riding Group of Gas Companies, where it will be officially opened to-morrow (Thursday) by the Mayor of Wakefield, supported by Col. W. Moncrieff Carr, Managing Director.

South-Western Gas and Water Corporation is paying on Oct. 19 an interim dividend on the Ordinary Shares of 2% (actual), less tax, in respect of the year ending Dec. 31, 1945.

When a Joint leaks—



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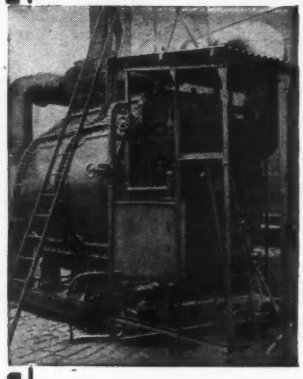

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The London Market Oct. 22.

There are no changes to report in the prices of Coal Tar Products.

There have been two developments of interest in connexion with Coal Tar Products, the first being the cancellation of Government contracts for toluene, and the second the issue of the Control of Benzole and Allied Products Order, 1945 (S. R. & O. 1945, No. 1064), which came into force on Sept. 1 and brings all Coal Tar Spirits under one and the same Order.

As from March 5, by the Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), the maximum price of Pitch for briquetting has been increased to 60s. per ton f.o.r. supplying works, and the prices for Road Tar, as fixed by the Coal Tar Products Prices Order, 1943, S. R. & O. No. 1528, have been increased by one half-penny per gallon. There is also an increase of 5s. per ton in the price of standard Creosote/Pitch Mixture.

Coal Tar Products Prices (No. 2) Order, 1944 (S. R. & O., 1944 No. 1051), allows increases in the maximum prices for all forms of Naphthalene.

The Provinces Oct. 22.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's. 2s. 4d. to 2s. 6¼d., pure, 3s. 2¼d. Carbolic acid, 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943, Naphthalene controlled under S. R. & O. 1944, No. 1051, operative from Sept. 22, 1944.

Attention is called to Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), referred to on p. 305, "JOURNAL" of March 7.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland Oct. 20.

Market is steady, with prices well held. Refined tar*: Yield to distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Stock markets opened the week quietly, the approach of the interim Budget and industrial uncertainties tending to reduce the volume of business. At one time considerable speculative activity took place among goldmining shares, and there were some sharp fluctuations in prices. As the week progressed the industrial market presented a brighter appearance, and towards the close the cut in the deposit and bill rates had a marked effect on the gilt-edged market, prices in this section being marked up substantially.

The Gas Market had a fairly quiet week, although the tone generally remained firm, with only the few price changes noted below. These were as at the close last Thursday before the reduction in the deposit rate was known, and it will be interesting to see what, if any, improvement will take place in the value of these securities in consequence. The leading ordinary and debenture stocks at current prices are yielding 4% or over, so that some appreciation is justified.

OFFICIAL LIST

Brighton 5 p.c. Cons.	107—112	+½
Imperial Continental	113—116	+1
Primitiva Holdings Ltd. Ord.	13/6—14/6	—/3d.
South-Eastern Gas Corporation Ord.	19/6—20/6	—/6d.
South Metropolitan Ord.	91—94	+1
Tottenham 5 p.c. Pref.	111—116	+1

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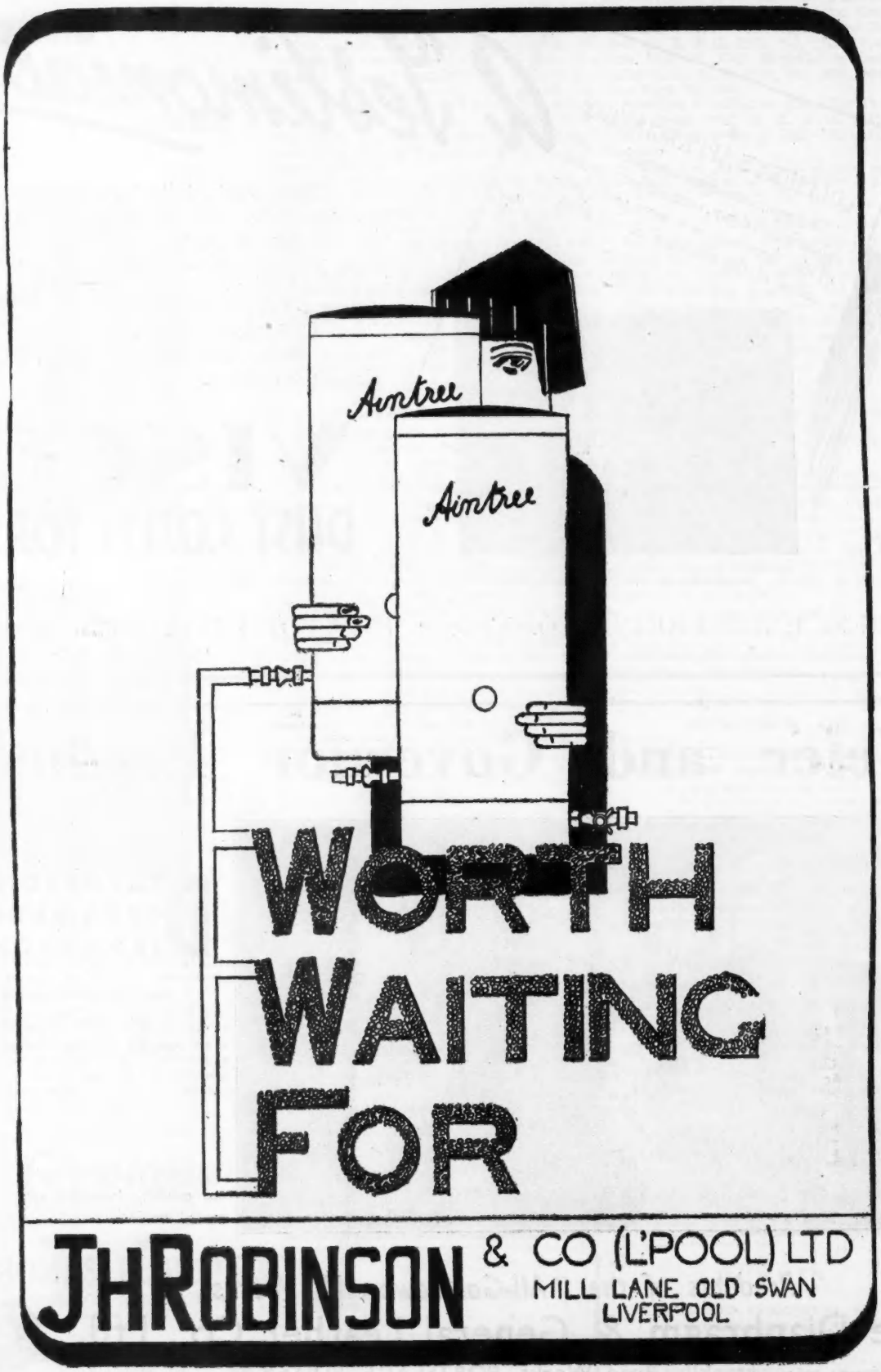
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Write to-day for "The Engineer's Guide to Success"—200 courses—free—which gives the regulations governing qualifications such as A.M.I.Gas E., A.M.I.Chem.E., A.M.Inst.C.E., A.M.I.Mech.E. A.M.I.E.E., C. & G., etc., and contains the widest choice of engineering courses in the world; the Department of Fuel and Chemical Technology covers Gas Supply, Gas Engineering, Gas Power, Chemical Processes, etc. The T.I.G.B. guarantees training until successful and Home-study students of the T.I.G.B. have gained 44 FIRST PLACES in the examinations of the major engineering institutions.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN

148, TEMPLE BAR HOUSE, LONDON, E.C.4

REPAIR WORK

STREET LIGHTING

COMPLETE Overhaul of Automatic Gas Controllers. State make and type. Quotations free on application to Geo. F. Hutchinson, M.B.H.I., 36, Lee Lane, Horsforth, near Leeds.

PLANT &c. FOR SALE & WANTED

'PHONE 98 STAINES.

FOR SALE.—24 ft. by 9 ft. and 17 ft. by 6 ft. Cylindrical Tanks; Thompson Lancashire Boiler 24 ft. by 7 ft., 120 lb.; 34 kw. Browett 220 volt Steam Generating Set; Weir Feed Pump 8¼ in. by 6 in. by 18 in.; Tangye 3-Throw Hydraulic Pump 3½ in. by 6 in.; Receiver 30 ft. by 7 ft. dia., dish ends ½ in. plate.

HARRY H. GARDAM & CO., LTD., STAINES.

FOR SALE.—500,000 cu.ft. capacity Vertical Centrifugal Washer Scrubber, complete with horizontal steam engine and shafts and necessary cast iron valves and connexions. In good working order. For full particulars and price apply to the Engineer, Yorktown (Camberley) and District Gas and Electricity Company, 235, London Road, Camberley, Surrey.

FOR SALE.—60,000 cu.ft. per hour Bryan-Donkin EXHAUSTER, with horizontal steam engine. Immediate disposal. Further particulars from J. Corrigan, Engineer and Manager, Gas-Works, Loughborough.

COUNTY BOROUGH OF STOCKPORT

(GAS DEPARTMENT)

FOR SALE.—WASTE HEAT BOILER. One Ruston and Hornsby Horizontal Multi-tubular WASTE HEAT BOILER. Steam raising capacity 10,000 lb. per hour at 150 lb. per sq. in. pressure from feed water at 120° F.

Boiler 7 ft. 3 in. diameter, 17 ft. long between tube plates, 250 tubes 2 in. outside diameter, 50 stay tubes 2½ in. outside diameter. Re-tubed 1943.

Complete with mountings and induced draught fan.

All particulars and facilities for inspection can be obtained from T. Reynolds, M.Inst.Gas E., County Borough of Stockport, Gas-Works, Portwood, Stockport.

Sealed Tenders marked "Tenders for Waste Heat Boiler" should be addressed to the Chairman of the Gas Committee, Town Hall, Stockport, and be received not later than 9 a.m. on Friday, November 9, 1945.

The Corporation do not bind themselves to accept any Tender.

ARTHUR BOND,
October 8, 1945. Town Clerk.

TO FACTORY OWNERS AND OTHERS

GOVERNMENT SURPLUS BENCHES. With the progressive closing down of Government War Factories, large quantities of second-hand heavy timber benches of solid and durable construction will from time to time become available for disposal in various parts of the country. A limited quantity is available for immediate delivery. The Benches, which are of varying types, condition and sizes up to 12 ft. long, 4 ft. wide, 3 ft. high, with 1¼-in. to 3 in. tops, suitable for assembly, packing and general purposes, will be for sale in minimum quantities of a dozen, and prospective purchasers should furnish particulars of their present or future requirements, giving quantities and approximate sizes, when further details with prices will be supplied as surpluses become available. Apply to Controller of Supplies, Ministry of Works, Union House, St. Martin's-le-Grand, London, E.C. 1, and mark envelope "Section Pa/A Benches."

CONTRACTS OPEN

SIDMOUTH URBAN DISTRICT COUNCIL

(GAS DEPARTMENT)

REINFORCED CONCRETE LIQUOR TANK

THE Council invite Tenders for the construction of a REINFORCED CONCRETE LIQUOR TANK of about 12,000 gallons capacity. Particulars can be obtained from the Engineer and Manager, Gas-Works, Sidmouth. Tenders in plain sealed envelopes endorsed "Concrete Tank" to be received by the undersigned not later than Monday, November 12, 1945.

Council Offices, R. PICKARD,
Sidmouth, Devon. Clerk of the Council.
October 16, 1945.

APPOINTMENTS WANTED

QUALIFIED Gas Engineer seeks Position of MANAGER of large or medium sized Gas-Works. —Midlands preferred. 35 years' experience in gas undertakings. Full particulars supplied on request.

Address No. 9484, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4.

APPOINTMENTS VACANT

None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

GENERAL FOREMAN

APPLICATIONS are invited for the Position of GENERAL FOREMAN at a works in the Home Counties. Applicants should have had experience of horizontal and vertical retorts and water gas manufacture. Commencing wage £7 per week.

Apply, stating Age, Experience and position in relation to the Essential Works Order, and include *copies* of recent Testimonials, to No. 9481, "GAS JOURNAL" 11, Bolt Court, Fleet Street, E.C. 4.

EXPERIENCED GASFITTERS and SERVICE LAYERS required immediately. Rate 1s. 9½d. per hour. Opportunities for Servicemen expecting early release. Applications, giving full particulars of training and position under Essential Works Order, should be sent to General Manager, Peterborough Gas Company, New Road, Peterborough.

This advertisement is published by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1945.

NEWTON CHAMBERS & CO., LTD., Thorncliffe Sheffield, require the services of two SENIOR DRAUGHTSMEN experienced in the preparation of drawings for gas-works plant. Applications, which will be treated in the strictest confidence, stating Age, Experience, and Salary required, should be sent to the Personnel Officer.

CITY OF BRADFORD

(GAS DEPARTMENT)

APPOINTMENT OF SENIOR COOKERY DEMONSTRATOR

APPLICATIONS are invited for the Position of SENIOR COOKERY DEMONSTRATOR and Home Service Organizer.

Candidates must have a good general education and hold a recognized Diploma in Domestic Subjects, and have had previous experience in conducting Lectures, Demonstrations, and organizing a Home Service Section. Knowledge of large scale cooking would be an advantage.

Salary according to scale, Grade 1 (Female) commencing at £190 per annum, rising by annual increments of £10 to £240 per annum, plus War Bonus, at present £48 2s. per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications should be submitted on Approved Form (obtainable from the Gas Engineer and Manager, Gas Department, Britannia House, Bradford), together with *copies* of recent Testimonials and details of previous and present appointments to the undersigned not later than November 10, 1945, in envelope endorsed "Senior Cookery Demonstrator."

Town Hall, N. L. FLEMING,
Bradford. Town Clerk.

CITY OF BRADFORD

(GAS DEPARTMENT)

APPOINTMENT OF SHIFT ENGINEER

APPLICATIONS are invited for the Position of SHIFT ENGINEER at a commencing salary of £315, rising to £345 per annum, in accordance with Grade 9 of the Salaries and Grading Scheme, plus present Cost of Living Bonus, which is £59 16s. per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications should be submitted on Approved form (obtainable from the Gas Engineer and Manager, Gas Department, Britannia House, Bradford) together with *copies* of three recent Testimonials and details of previous and present appointments to the undersigned not later than November 10, 1945, in envelope endorsed "Shift Engineer."

Town Hall, N. L. FLEMING,
Bradford. Town Clerk.

(Classified Advertisements continued on p. 576)

APPOINTMENTS VACANT (ctd.)

CHELTENHAM AND DISTRICT GAS COMPANY
CHEMIST

APPLICATIONS are invited for the above Position at a Salary (inclusive of War Bonus) of £380 per annum. Applications addressed to the undersigned should be received not later than November 7, 1945, and should be accompanied by Testimonials.

North Street, Cheltenham. A. L. MORRIS, General Manager.

BOROUGH OF COLWYN BAY
(GAS DEPARTMENT)
DISTRIBUTION SUPERINTENDENT

APPLICATIONS are invited for the above Position at a salary of £305 per annum, plus cost of living bonus (at present £59 16s. per annum).

Applicants must possess recognized Technical Qualifications, and have had practical training in all branches of distribution work and control of labour.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.

Applications endorsed "Distribution Superintendent," stating Age, Qualifications and Experience, together with *copies* of three recent Testimonials, should be forwarded to the undersigned not later than November 1, 1945.

Candidates should state their position in relation to the Essential Works Order.

Town Hall, Colwyn Bay. HAROLD E. BRAITHWAITE, Town Clerk.

SHEFFIELD AND DISTRICT GAS COMPANY
ASSISTANT GENERAL MANAGER

APPLICATIONS are invited from persons not more than 45 years of age for the position of ASSISTANT GENERAL MANAGER.

The salary paid will be in accordance with Qualifications and will include a War Bonus. A Superannuation Scheme is in operation to which the successful candidate would be required to contribute; a Co-Partnership Scheme is also in being.

Candidates should have had Gas-Works experience, have a sound commercial knowledge, together with experience in matters of administration.

The successful candidate will be required to pass a medical examination.

Testimonials will not be required in the first instance.

Applications should be addressed to the undersigned to reach him not later than October 31, 1945.

The Sheffield and District Gas Company, Commercial Street, Sheffield 1. RALPH HALKETT, General Manager and Chief Engineer.

October 8, 1945.

COUNTY BOROUGH OF DARLINGTON
(GAS DEPARTMENT)
APPOINTMENT OF DEPUTY GAS ENGINEER

APPLICATIONS are invited for the appointment of DEPUTY GAS ENGINEER. The Salary will be £625 per annum, plus Cost-of-Living Bonus, which is at present £59 16s. per annum, rising by annual increments of £25 to £700 per annum.

Applicants must be Corporate Members of the Institution of Gas Engineers, have a sound experience in the control of all Departments of a large Gas Undertaking, including Works and Distribution, with practical experience of Modern Gas Manufacture and Water Gas Plants, and be capable of preparing designs and specifications for Gas-Works Plant and Structural Work. Applicants must not be more than 40 years of age.

The appointment is subject to the Local Government Superannuation Act, 1937, and satisfactory medical examination. Canvassing, directly or indirectly, is prohibited, and will be deemed a disqualification. Candidates must state their position in relation to the Essential Works Order and National Service Act. Applications from persons serving in His Majesty's Forces will be considered if early release is anticipated.

Applications, giving full details of Age, Training, Qualifications and Experience, endorsed "Deputy Gas Engineer," together with *copies* of three Testimonials, to be delivered to the undersigned not later than November 30, 1945.

11, Houndgate, Darlington. H. HOPKINS, Town Clerk.

October 4, 1945.

ASSISTANT WORKS MANAGER required with drawing office and works experience of gasholder and plate construction work. Must have sound organizing ability and be a good disciplinarian. Apply, stating Age, Wages, Experience and full particulars to No. 9483, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4.

COUNTY BOROUGH OF ST. HELENS
(GAS DEPARTMENT)
APPOINTMENT OF HOME SERVICE COOK-DEMONSTRATOR AND SHOWROOM ATTENDANT

APPLICATIONS are invited for the above appointment.

The Salary will be Lancashire and Cheshire Provincial Council Scale P.T.A., Grade "B" (Female), commencing on the maximum.

Maximum £236 per annum, plus War Bonus, which is at present £48 2s. per annum.

Candidates must have had a good general education and hold a recognized Diploma or equivalent qualification in Domestic Science and/or Housecraft, and should possess a thorough knowledge of Gas Domestic Appliances.

They must be experienced in conducting Lecture Demonstrations both in Showrooms and on consumer's premises, and able to advise consumers on the selection and use of gas apparatus.

Experience in organizing a Home Service Department in Canteen Work, School Feeding and the like will be an advantage.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, accompanied by *copies* of not more than three Testimonials, should be made to the undersigned and be received by him not later than Monday, October 29, 1945, in an envelope endorsed "Home Service."

Gas-Works, Warrington New Road, St. Helens, Lancs. R. L. GREAVES, Gas Engineer and Manager.

October 11, 1945.

CITY OF PERTH
(GAS DEPARTMENT)

APPLICATIONS are invited for the following vacancies, each of which carries a Salary Scale of £270/350 per annum, plus a War Bonus of £60 per annum. Placing on the Scale will be according to qualifications and experience.

(*a*) CHEMIST to take charge of Laboratory work and train young Staff.
(*b*) DRAUGHTSMAN to take charge of all Drawing Office work.
(*c*) A WORKS TECHNICAL ASSISTANT (junior to Superintendent and Senior Technical Assistant).
(*d*) A Chief FITTERS' INSPECTOR.
(*e*) Also at a Salary Scale of £230/260 per annum plus similar War Bonus—a FITTERS' INSPECTOR.

The position of DISTRIBUTION SUPERINTENDENT at a Salary of £400/450 per annum plus War Bonus has not yet been filled.

Applications, stating position under National Service Acts, giving full particulars of Age, Training, Experience, and Qualifications, with *copies* of recent Testimonials, should be received by the undersigned not later than November 1, 1945.

Gas-Works, Friarton, Perth. W. NICOL BAIRD, Engineer and Manager.

October 13, 1945.

WANTED.—Draughtsman capable of general plant and works layout. Minimum Salary £300 per annum. Applications, stating Age, Experience and position under National Service and Essential Works Order, by November 15, 1945, endorsed "Draughtsman," to T. W. T. Hammerton, Manager, East Hull Gas Company, St. Mark Street, Hull.

MAIN AND SERVICE LAYER

A well trained MAIN AND SERVICE LAYER is required for the Tewkesbury (Gloucestershire) district. Applicants should be accustomed to working with high pressure gas, and preferably have a knowledge of high pressure service and district governors. Service laying and repairing will be the chief duties. Rate 92s. 1d. per 47-hour week.

Applications, giving particular of Training and Experience, also stating position under Essential Works Order, should be in writing addressed to the undersigned.

Cheltenham and District Gas Company, North Street, Cheltenham. A. L. MORRIS, General Manager.

GENERAL FOREMAN

APPLICATIONS are invited for the Position of GENERAL FOREMAN at a 120 million Works in the Home Counties. Applicants should have had experience of horizontal retorts, C.W.G. Plant, Benzole Plant, and be able to control labour. Salary £250–£275–£300 plus war bonus, at present £74 15s. p.a. House available.

Applications, stating Age, Qualifications, details of present employment and position under the Essential Works Order, together with *copies* of two recent Testimonials, should be forwarded by November 5 to No. 9485, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4.

WANTED.—Fully experienced (*a*) **GAS FITTER,** (*b*) MAIN AND SERVICE LAYER. District Union Rate 1s. 8½d. per hour.

Application, stating Training and Experience, should be sent to the Manager, Gas-Works, Okehampton, Devon.

BOROUGH OF CAERNARVON
(GAS DEPARTMENT)
WORKS FOREMAN

APPLICATIONS are invited for the Position of WORKS FOREMAN from persons who have experience in the control and supervision of Horizontal Retorts, Water Gas Plant, Benzole Plant, and the maintenance of Boilers, Exhausters, Pumps and all General Works Plant and Machinery.

Experience in the supervision of labour is essential.

Salary: £260–£280 per annum, plus war bonus, which is at present £59 16s. Modern house available at low rent.

The post is designated under the Local Government Superannuation Act, 1937, and the successful applicant will require to undergo a medical examination.

Applications, endorsed "Gas Works Foreman," stating Age, Qualifications, Experience and position regarding the Essential Works Order, accompanied by *copies* of two recent Testimonials, should be received by the undersigned not later than November 7, 1945.

Canvassing, directly or indirectly, will be a disqualification.

Gas-Works, Caernarvon. R. B. GARSIDE, Engineer and Manager.

October 17, 1945.

MUNICIPALITY OF SINGAPORE

APPLICATIONS are invited for the following appointment, in the first instance under the War Office, but eventually under the Municipality of Singapore for service in Singapore:

GAS ENGINEER—one—Ref. C.2828XA.

Applicants should be Corporate Members of the Institution of Gas Engineers.

Salary would be from $300 to $700 a month, Class IV S.M. Salary Scale, rising by annual increments. Point of entry into the salary scale would depend on qualifications and experience. The dollar is equal to 2s. 4d.

Period of service would be for three years in the first instance, with opportunity if service was approved to join the permanent staff. There is a Municipal Provident Fund, but no pension. Free passages and quarters either free or at a low rental would be provided.

Write, quoting C.2828XA, to Ministry of Labour and National Service, Appointments Department, Technical and Scientific Register, Room 670, York House, Kingsway, London, W.C. 2, for application form, which must be returned completed by November 7, 1945.

(10.10.A.19.)

PETERBOROUGH GAS COMPANY
APPOINTMENT OF ENGINEER, MANAGER AND SECRETARY

THE Directors invite applications for the appointment of ENGINEER, MANAGER AND SECRETARY, shortly to become vacant, at a commencing Salary of £1,100 per annum, plus House, Gas and Coke.

Applicants must be fully qualified Engineers, possessing suitable technical, administrative and commercial qualifications.

The person appointed will be required to devote the whole of his time to the duties of the office.

The appointment will be determinable by three months' notice on either side.

Applications, stating Age, Qualifications, present appointment and duties, and full details of Experience, accompanied by *copies* of not more than three recent Testimonials, must be addressed to the Chairman, Peterborough Gas Company, New Road, Peterborough, endorsed "Engineer, Manager, and Secretary," not later than Friday, November 9, 1945.

R. PRINCE, Director, General Manager and Secretary.

October 16, 1945.

APPLICATIONS are invited for the Position of ASSISTANT GAS ENGINEER to South of England Company. Candidates must have had a thorough training with practical experience in the control of gas manufacturing processes; the maintenance of all Gas-Works Plant; the control of men; distribution experience, including high and low pressure distribution and the utilization of gas for domestic purposes.

Commencing Salary £350 per annum plus cost of living bonus, at present £62 10s.

The successful applicant will be required to pass a medical examination and contribute to the Company's Pension Scheme.

Applications, stating Age, Experience, accompanied by *copies* of two references to No. 9486, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4.

Get in on the Under Belly of RUST (Engineers' Enemy. No1.)
Years of Wear instead of Weeks
GRANT & WEST, LTD
'PHONE NORTH 2160
Steel Wires, Ropes & Cables running in and out of Water, Gas, Sulphurous Fumes, etc. will never RUST if treated with
ROPRES
IT KILLS RUST
STAYS on every STRAND.
RUST KILLS ROPES.—but ROPRES rope preservative KILLS RUST. Use ROPRES
Try a Tin on our Guarantee
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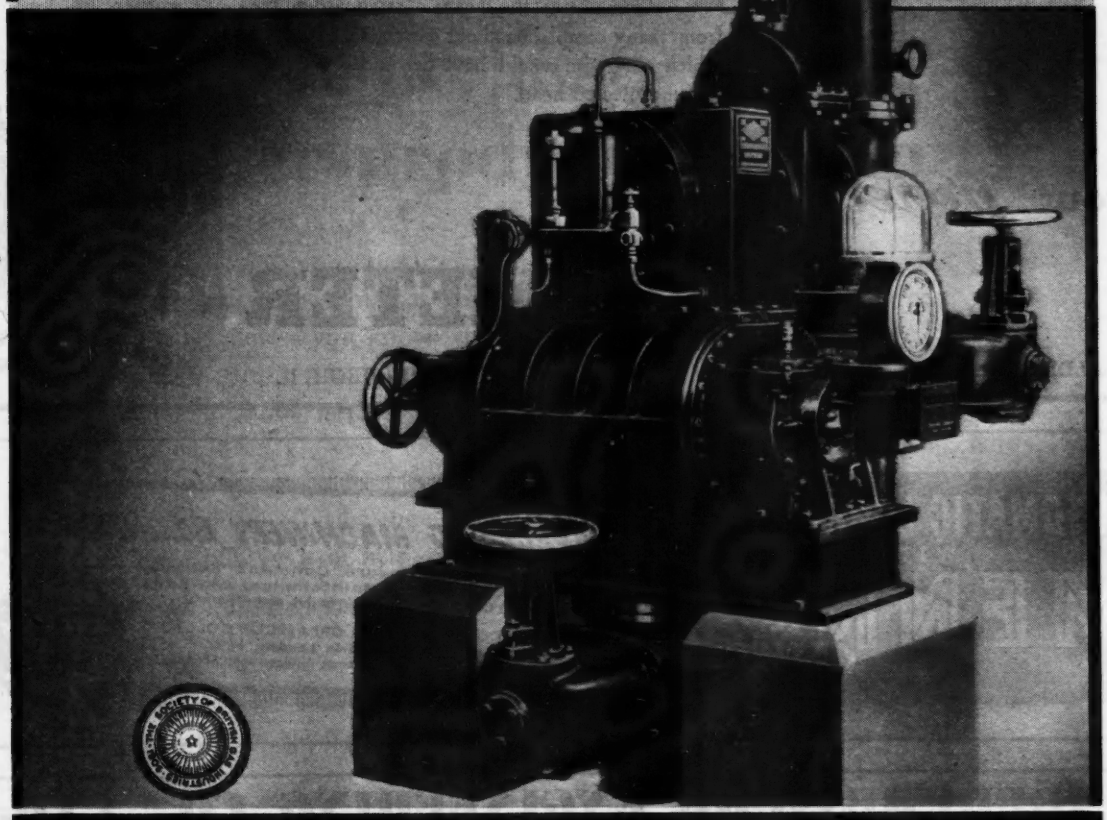

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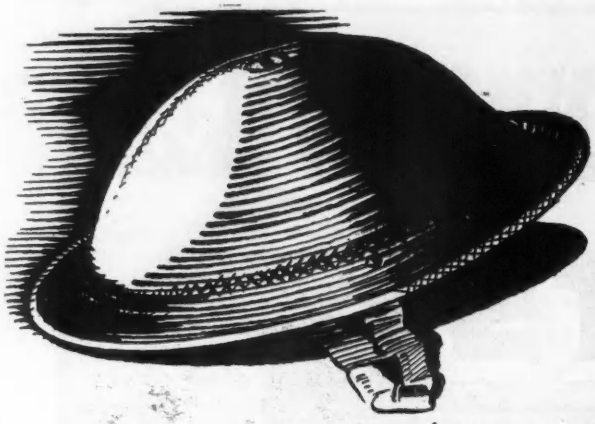

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THE STEEL HELMET—more familiarly known as the "Tin Hat"—has, since its inception, been the means of saving hundreds and thousands of lives. Its protective qualities are too well known to be enlarged upon. The Gas Meter—in particular the A. & M. Meter—has been the means of safeguarding the Gas Engineer from many complaints about gas consumption which otherwise would have descended upon his unprotected head.

your *protection* is the

"A&M" METER

ALDER & MACKAY LTD., NEW GRANGE WORKS, EDINBURGH, 11.

AUTOMATIC LUBRICATION WITH MENNO CUPS

SAFEGUARD MACHINERY BEARINGS

MENNO CUPS ensure Constant Reliable Running, Economy in Maintenance, and Save Time in Attention. Simple to Fit and Operate.

The MENNO COMPRESSED AIR GREASECUP CO. LTD.
Leeds Place, Tollington Park, London, N.4.
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SPECIFY MENNO CUPS FOR LUBRICATION

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SPLIT COLLARS
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NORFOLK HOUSE, NORFOLK STREET, STRAND, W.C.2

NOTICE OF OPENING OF LONDON STOREHOUSE AT
VALE ROYAL, KING'S CROSS, W.C.2
Everything for Gas and Waterworks Maintenance

CENTRAL ACTION DRILL STANDS
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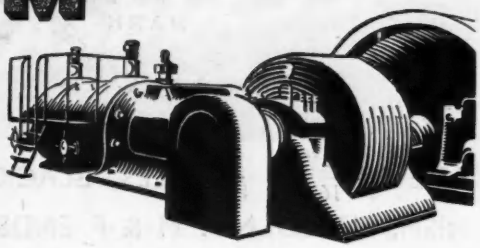
TOOLS, ETC.

GASHOLDERS PURIFIERS WASHERS CONDENSERS GAS VALVES CASTINGS WELDED PIPES STEELWORK

POWER FROM STEAM



How to make a servant of your power-producing medium

A good captain knows the idiosyncrasies of his team; a good workman knows his tools—a bad one blames them. You cannot expect to get the best out of your steam unless you know what its properties and capabilities are.

You may think that you know all that is necessary for the operation of your power plant, but unless you understand the Steam Tables thoroughly you cannot be sure. Do you know whether your steam engine is operating efficiently, what its steam consumption should be, what it actually is? Do you know *all* the possibilities of using the exhaust for process purposes?

These Bulletins will help you

STEAM FOR PROCESS HEATING
(*Bulletin No.* 25)

A simple introduction to the properties of steam leading to a more critical understanding of the steam tables.

COMBINED POWER AND HEATING
(*Bulletin No.* 40)

A complete survey of the possibilities of using the exhaust steam from an engine for process purposes, or for developing power from the steam before it reaches the process. This bulletin is written in a form suitable not only for the engineer and the specialist but also for the management.

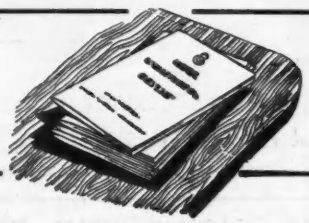
STEAM FOR POWER (*Bulletin No.* 33)

An explanation of the power-producing properties of Steam. Read No. 25 first and then this bulletin, which, among other things, explains "entropy" without advanced mathematics.

THE EFFICIENT OPERATION OF STEAM ENGINES
(*Bulletin No.* 34)

The practical side of steam engine operation: how to get the most power from the least steam. What the indicator diagram is and what it means.

Few people know how interesting steam can be until they have had to learn about it. These bulletins make the learning easy. If you haven't all the copies you require, they can be obtained free on demand from the Ministry's Regional Offices.



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METAL-LINED RUBBER PUSHONS, M or F ENDS

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REDHILL, SURREY

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Our Services to the Gas Industry comprise

Supply of LANCASHIRE & CORNISH BOILERS
the EXPEDITIOUS REPAIRS *to same*
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Supply of RIVETED *or* WELDED GAS MAINS
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BUILDING *of Boiler Houses, Boiler Setting and* CHIMNEY SHAFTS *by our own* SPECIAL STAFF.

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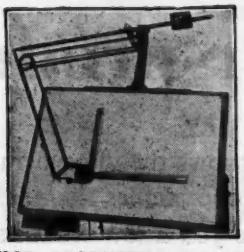

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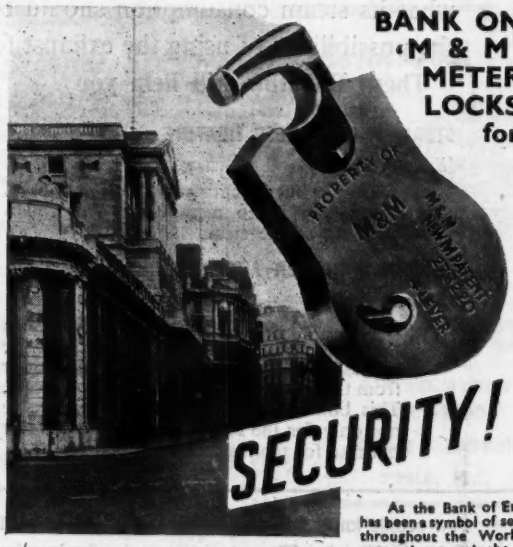
JEAVONS ENGINEERING COMPANY

(Props.: E. E. JEAVONS & Co. Ltd.)

TIPTON STAFFS

Grams: "PIPELINES" Phone: TIPTON 1621 (3 lines)



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As the Bank of England has been a symbol of security throughout the World for generations—so is the 'M & M' Meter Lock the symbol of gas meter security. Meter locks—perhaps 'the needle in the haystack' of gas industry equipment can be the guardian of profits and is therefore worthy of serious consideration. The 'M & M' lock will resist almost any form of violence, will not rust and gives years of faultless service. Lever type, recognised as the safest type. It is a trouble-free lock worth double any cheap imitations—but let us quote you and send sample lock to prove our claim.

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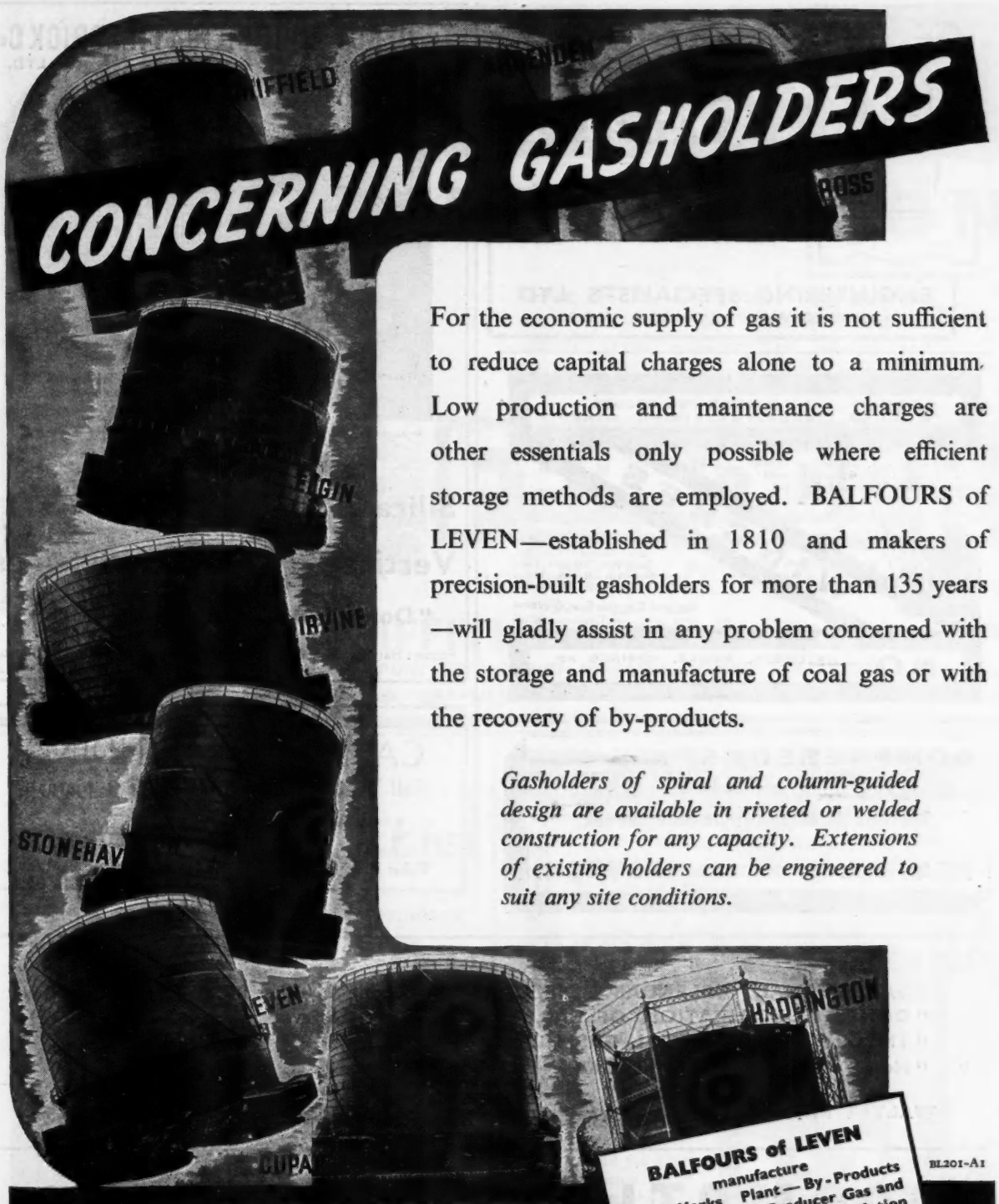

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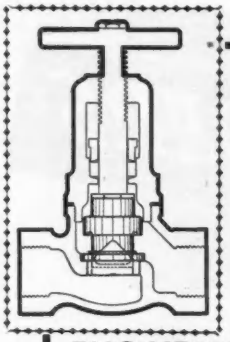

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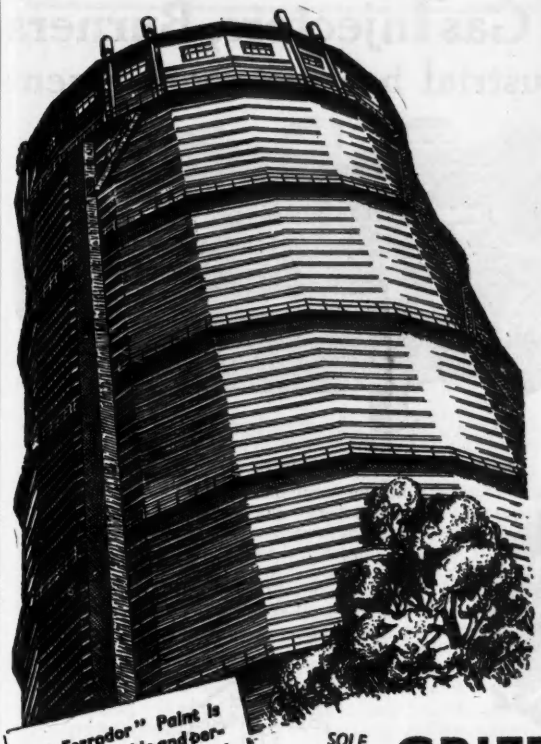

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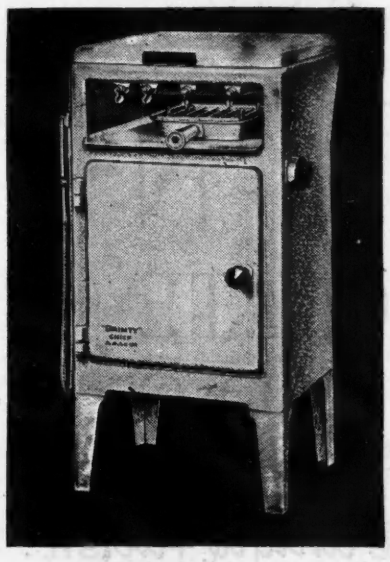

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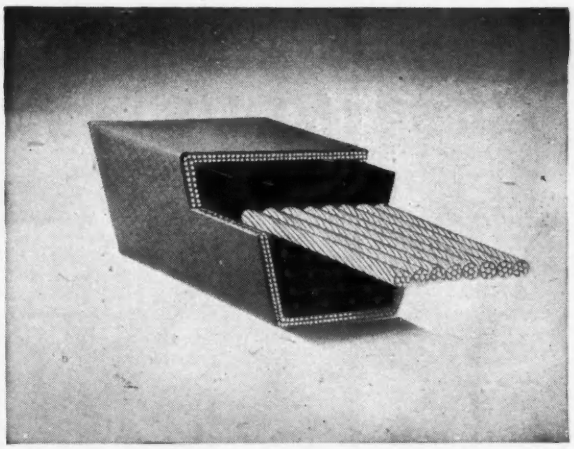

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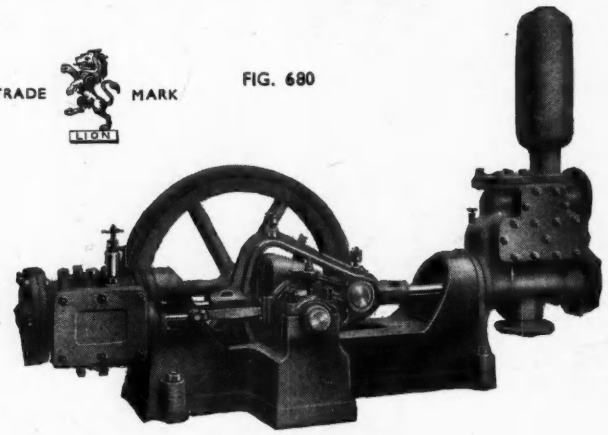

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